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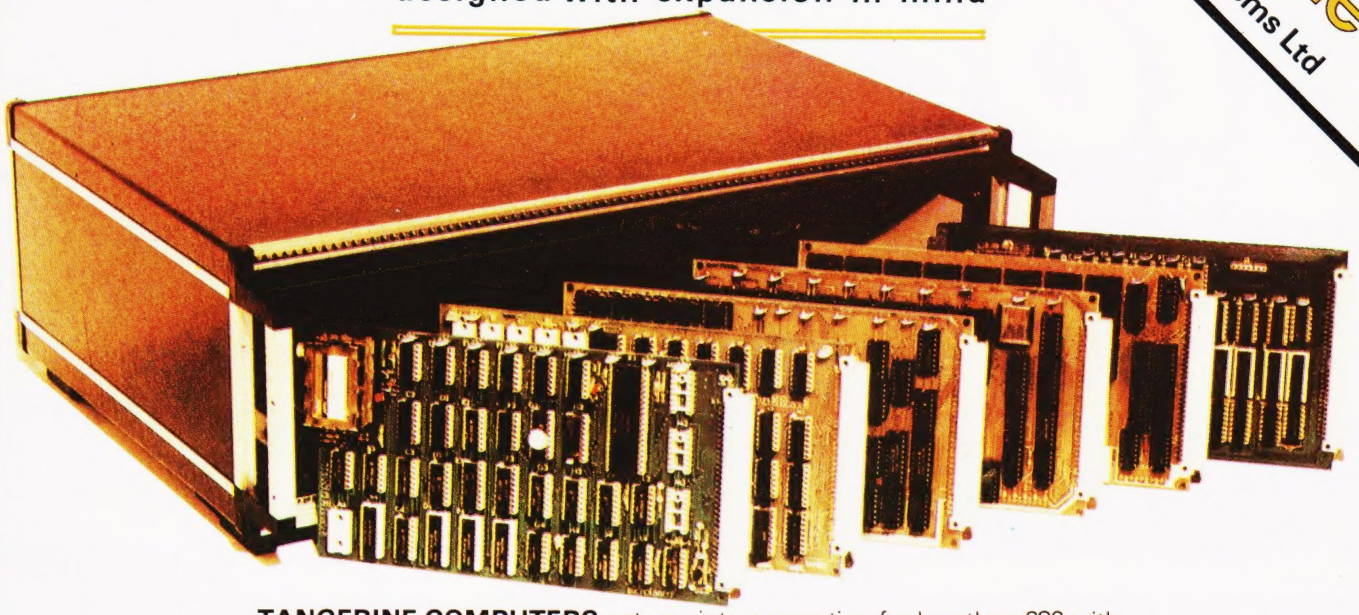

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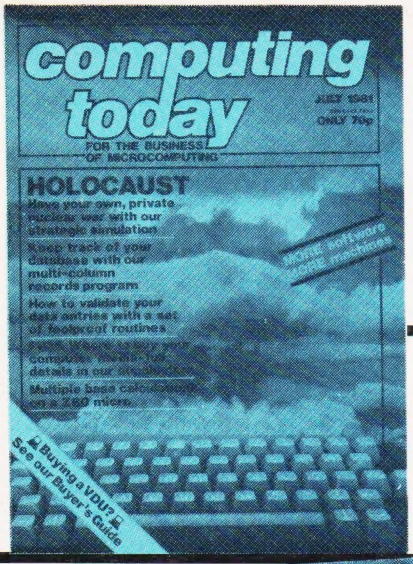

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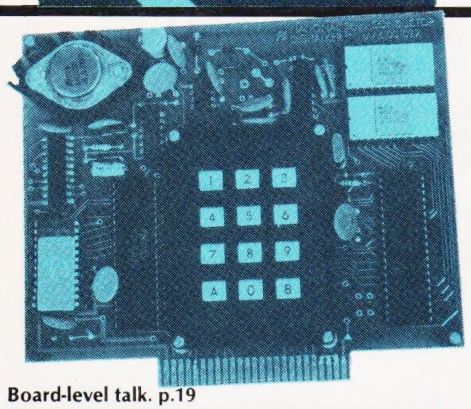

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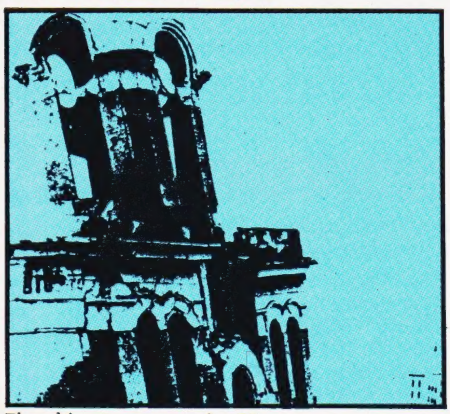

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Last chance to register for the Computing Today Seminar . . . see page 12

Computing Today is constantly on the look-out for well written articles and programs. If you think that your efforts meet our standards please feel free to submit your work to us for consideration.

All material should be typed, but neat hand-written copy may be considered. Any programs submitted must be listed, cassette tapes and discs will not be accepted, and should be accompanied by sufficient documentation to enable their implementation. Please enclose an SAE if you want your manuscript returned, all submissions will be acknowledged. Any published work will be paid for.

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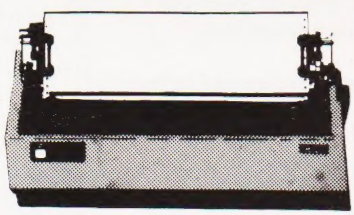

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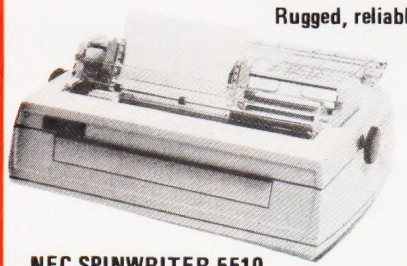

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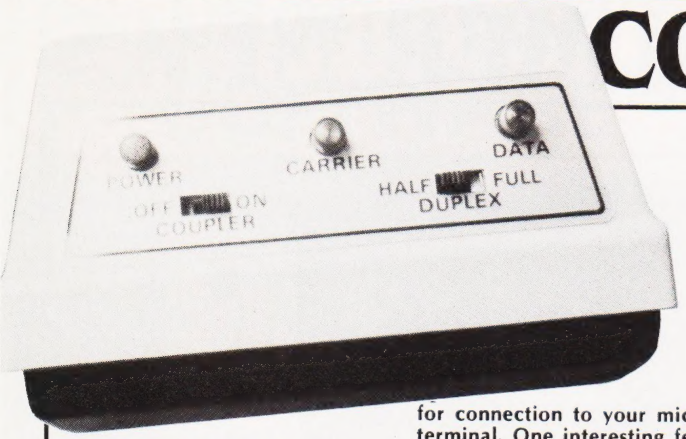
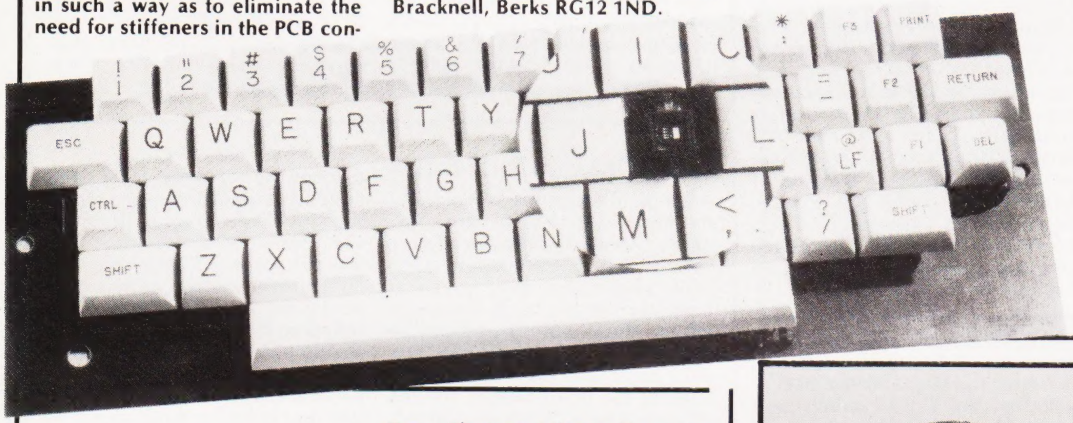


GROWL DOWN THE PHONE

Lion Micro Computers are now stocking the £200 acoustic modem from K&N Electronics. The unit operates at 300 baud and is equipped with an RS232/V 24 interface for connection to your micro or terminal. One interesting feature is that it can be powered by batteries, dry cell or rechargeable, if required — there is an internal charging unit. The product is approved by British Telecom and more information can be obtained from Lion at their Tottenham Court Road or Brighton shops.

REPAIRABLE KEYBOARD

A new, repairable keyboard array has been introduced by Waycom. As well as standard 54 and 62 key units, custom versions can be supplied with up to 63 keys on a five-row arrangement. Moulded housings for the key arrays are designed in such a way as to eliminate the need for stiffeners in the PCB construction. The replaceable contacts are easily exchangeable without any chance of damage to either the housing or the PCB. Key caps are available in various colours, shapes and sizes and are double shot moulded for long life. For further product information contact Waycom at Wokingham Road, Bracknell, Berks RG12 1ND.



SCHOOLS GET SUPPORT

Following the announcement that schools will be able to buy selected microcomputers at half price, Sinclair Research, producers of the ZX81, have announced their own scheme. The two systems eligible for the grant are the Acorn/BBC system and the already established Research Machines 380Z. Sinclair are offering a basic ZX81 with the 16K RAM pack at half price, approximately £60. The printer, when it becomes available, will add £30 to the overall cost of the package. Commodore have also been in touch with the BBC over software compatibility between the VIC and the Acorn/BBC system. It is believed that they may also make some move on the schools front in the near future. VIC will make its UK debut at the PET show in the West Centre Hotel between June 18th and 20th. Regardless of who supports the purchase of what computer, be it Government department or manufacturer, one outcome is certain — the schools will get a better deal.

LANGUAGE FOR GAMES

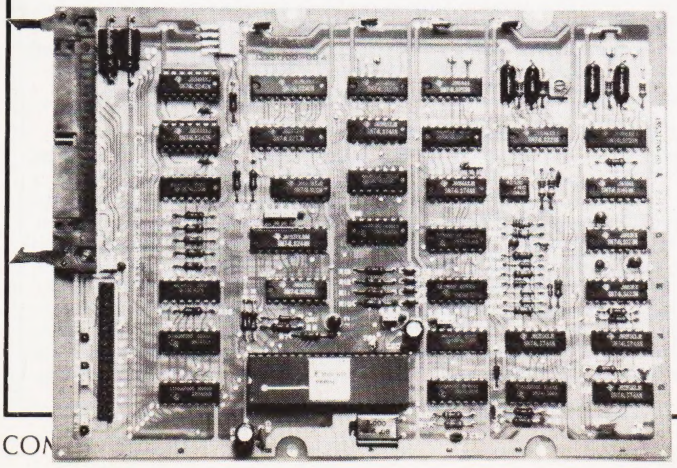
A special language has been developed specifically for producing games programs on the 40 column PET computers. Called VIGIL (Video Interactive Game Interpretive Language) it provides some 60 commands for graphics manipulation and double density plotting. It also provides access to two event timers and can generate tones if you attach an external speaker. Nine demonstration programs are supplied and you can save and load the programs you generate on tape. VIGIL will cost you $40 from Abacus Software, PO Box 7211, Grand Rapids, Michigan 49510, USA. Please mention where you saw the news item when you contact them.

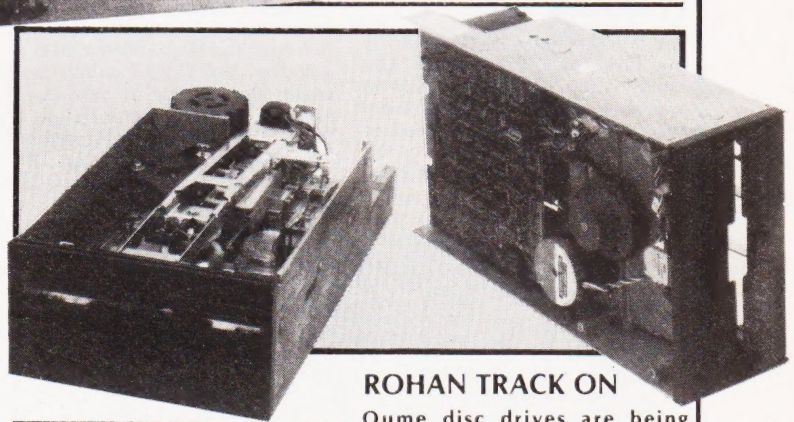
PERFECT PROGRAMS?

We are trying an experiment this month with the four major programs. Holocaust, MaxiMander, Multicolumn Records and MicroAssembler have all been converted into our standard format from running programs and then dumped onto a high quality printer. This should mean that there are no typographical errors but, owing to the slightly odd daisy wheel on the printer, the 'up-arrow' symbol has been reproduced throughout as '©'. Our grateful thanks to the staff of Baroness International for the loan of their equipment for this exercise. If you have any comments on the presentation of the programs in this format please drop me a line at our offices and, if opinion is favourable, we'll try to make this a regular feature.

TAKING CONTROL

Tekdata have introduced a general-purpose floppy disc controller capable of interfacing up to four single or double sided drives with either single or double density recording to any popular micro. Sector format is IBM compatible, and data may be written and read under program control or by DMA. Connection is by a 50-way connector to the micro and a 34-way connector to the drives which can be Teac, Shugart, Micropolis or any other industry standard types. The controller PCB handles all the track seeking logic and there are a number of registers for loading data and commands into from the micro. Power requirements are +12 V at 30 mA and +5 V at 600 mA and the unit will set you back £150.33. For more detailed technical information contact Tekdata Electronics at Unit 1, Federation Road, Burslem, Stoke-on-Trent, or ring them on 0782-813631.





PRIZES AND PRINTERS

Micro Peripherals are offering an engraved rosebowl for the best program written by a school to assist industry. The trophy will be held for one year and the first presentation will be held at the 1982 London Computer Fair. They are also increasing their range of printers and now stock the Epson MX 70 at £259, the MX 85 screen dump printer and the MX 100 136 column at £575. For details on the printers and the competition contact Micro Peripherals at 61 New Market Square, Basingstoke, Hants.

ROHAN TRACK ON

Qume disc drives are being distributed by Rohan Computing in both 8" and 5¼" forms. The units are Shugart and IBM compatible and are double sided. Controllers will be available in a variety of options including DEC, Apple, IMS and RS232 and Rohan will be marketing complete assemblies as well as the OEM units. The new distributorship is in addition to the one Rohan already hold for the Qume daisywheel printer range. For details on the technical specification and pricing of these drives contact Rohan at 52 Coventry Street, Southam, Warks CV33 OEP or you can telephone on Southam 4045.

CONSUMER NEWS

SPEAKING MADE EASY

No, this isn't a product for budding lecturers, but a phoneme programmed speech synthesiser. Called Speakeasy, it uses an electronic model of the vocal tract to convert the sequence of phoneme codes into speech. Interfacing is simplicity itself, and all that is required is a parallel port with two control lines. Phonemes are the smallest unit of speech that can exist within a word. If you change a phoneme in 'six', for example, you could end up with 'socks'. The Speakeasy unit can produce 25 consonant types, 36 vowel types and has three pauses of varying lengths. Any of these 64 can be accessed by a six-bit code; the remaining two bits are used to control the inflexion. The pitch of the 'voice' is preset, as is the volume, by two controls on the unit. For further product information contact Wide Band Products at Cambridge Road, Orwell, nr Royston, Herts.

SPACE FOR FREE

The Amateur Computer Club has negotiated a number of free stands for computer clubs at the Personal Computer World show in September at the Cunard Hotel. Any club wanting to apply for a small stand area or wanting promotional material to be handed out on their behalf at the show should contact David Annal, ACC Exhibition Organiser, at 142 Windermere Road, London SW16 5HE as soon as possible. As well as the space for the clubs there will also be an area set aside for ComputerTown UK, the community computer education project. ComputerTown runs on a voluntary assistance basis: people with computers and time to spare let interested members of the public get at them. There are currently 17 local groups in operation. Details on the organisation, which is free to join, can be obtained from ComputerTown UK, c/o 14 Rathbone Place, London W1P 1DE.

HIGH SPEED NASCAS

Fancy some fast storage for your NASCOM without the expense of floppy discs? A new product called Cassette File Store, from Grange Electronics, might be the answer. Based on the Philips DCR220 mini digital cassette, it provides up to 96K of storage with a transfer rate of 6000 bps. An operating system is supplied called NASCAS which provides LOAD, SAVE, DELETE and RENAME commands and allows the user to store BASIC, text and machine code files. The unit does not need to be connected to the bus, it operates through a single PIO port. All the working parts, together with their own power supply unit, are housed in a metal case and will set you back £170. For details contact Grange Electronics at Stone Lane, Wimborne, Dorset BH21 1HD, telephone 0202-884 752.

COMPILED AGAIN

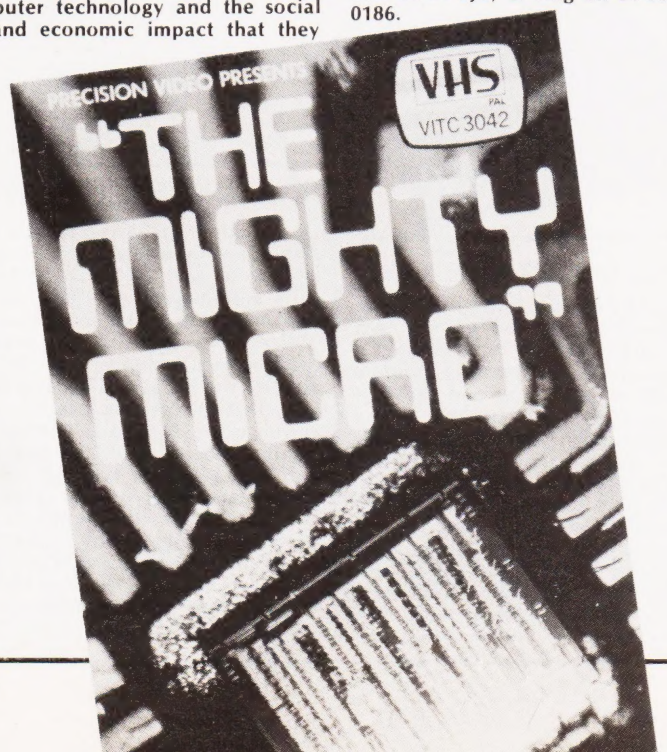
Following smartly after the announcement of Drive Technology's Compiling BASIC for the PET comes a similar product from Intex Datalog. Called PC-BASIC, it is currently available for versions running BASIC 2. A BASIC 4 implementation will be available in September. Fully compatible with the existing Interpreter, it consists of a disc-based machine code program and a 'run-time' package in EPROM. Compiling takes place at approximately 50 lines of code per minute with a maximum program size of some 28K. PC-BASIC also offers some extra facilities such as integer loops, RUN/STOP enable/disenable, auto-run programs together with variable table and line reference generation to aid debugging. Programs compiled under this system will need the EPROM to run and this will be available separately at approximately £25. The complete compiler package costs £300 and further information can be obtained direct from Intex Datalog at Eaglescliffe Industrial Estate, Eaglescliffe, Stockton-on-Tees, Cleveland TS16 OPN. Telephone enquiries should be directed to Eaglescliffe (0642) 781193.

NASCOM BOUNCE BACK

After months of uncertainty about the future of one of Britain's first micro companies Nascom's future has, at last, been assured. They have been taken over by Lucas Logic, part of the Lucas Industries group. The product name will be retained, as will the current product lines, and they are actively looking for more outlets for the product. Many of the new boards developed but held back from production by the recent financial troubles will now see the light of day and the company is also determined to expand the range. One of the most likely areas of interest is the educational market and sources suggest that a fully BBC compatible system will emerge before the year is out. Based on a tidied-up NASCOM 2 the product should provide an excellent alternative to the two other machines. Lucas stress that all the production will be in-house and, with the strong financial backing of the parent company, the future of Nascom looks assured at long last.

EVANS ON TAPE

The much acclaimed TV series by the late Dr Chris Evans, 'The Mighty Micro', is now available on a three-hour videocassette from EnterVision. The series consists of six half-hour programmes on the origins and development of computer technology and the social and economic impact that they will have. Anyone with an interest in micros — in schools, colleges, in-house training and the like — will find the £39.95 money well spent. For details of your local stockist contact EnterVision at Suite 411, London International Press Centre, 76 Shoe Lane, London EC4A 3JB, or ring on 01-353 0186.



CUTTING PRINTER PRICES

A price war is being fought in the printer market. Two distributors have just announced cuts on certain models and Centronics are celebrating their 10th anniversary by cutting the price on their excellent 737 matrix printer. One of the distributors is X-Data, who are offering the Microline 82 at £399, previously £550, from May 1st. They can be contacted at Marish Wharf, St Mary's Road, Langley, Slough, Berks SL4 1HE. Another price cut comes from MBS Terminals, who have reduced the Honeywell S10 by £75 to £435. They can be contacted at Aldwych House, Madeira Road, West Byfleet, Surrey. Full details on the models mentioned can be found in our Buyer's Guide, published last month. Telephone numbers are Slough 49117 for X-Data, and 09323-52937 for MBS Terminals.

MICROS HIT THE SMALL SCREEN

The first of the BBC's micro-orientated programmes is currently being transmitted at an unearthly hour on Sunday mornings. Called 'Managing The Micro', it is aimed at making decision-makers and middle management aware of the possibilities that microelectronics have to offer in industry and commerce. The series is presented by Brian Redhead and there is a 'support-pack' of literature from the BBC to go with the series. From my viewing of several segments of the five programmes and the complete first and second episodes, it is certainly worth watching to see if your business could benefit. The series will be repeated on BBC1 from 8th June on Mondays in the late evening.

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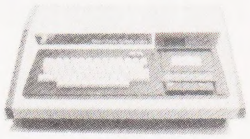

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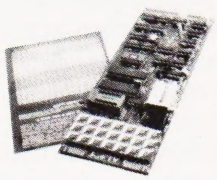

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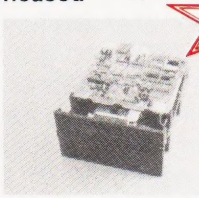

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ACORN ATOM

To use the ATOM immediately you just connect the plug to the power supply and cable into an aerial socket of TV. ACORN ATOM built 8K, 2K RAM £150 + VAT, Power supply £10.20 + VAT. Includes cassettes with programmes.

Q-Tek Systems Ltd

2, Daltry Close, Old Town,
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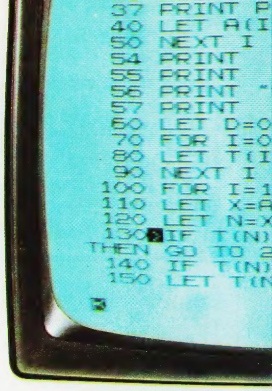
Otherwise carriage at cost

New! Sinclair ZX81 Personal Computer.



Kit: £49.95 complete

Built: £69.95 complete

Reach advanced computer comprehension in a few absorbing hours

1980 saw a genuine breakthrough – the Sinclair ZX80, world's first complete personal computer for under £100. At £99.95, the ZX80 offered a specification unchallenged at the price.

Over 50,000 were sold, and the ZX80 won virtually universal praise from computer professionals.

Now the Sinclair lead is increased: for just £69.95, the new Sinclair ZX81 offers even more advanced computer facilities at an even lower price. And the ZX81 kit means an even bigger saving. At £49.95 it costs almost 40% less than the ZX80 kit!

Lower price: higher capability
With the ZX81, it's just as simple to teach yourself computing, but the ZX81 packs even greater working capability than the ZX80.

It uses the same micro-processor, but incorporates a new, more powerful 8K BASIC ROM – the 'trained intelligence' of the computer. This chip works in decimals, handles logs and trig, allows you to plot graphs, and builds up animated displays.

And the ZX81 incorporates other operation refinements – the facility to load and save named programs on cassette, for example, or to select a program off a cassette through the keyboard.

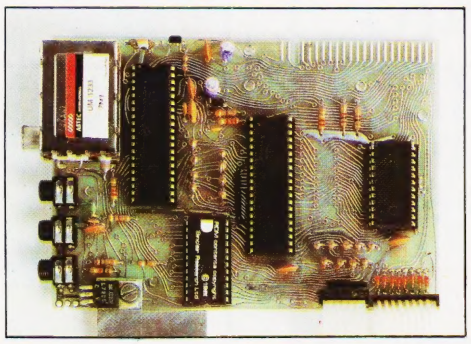
Higher specification, lower price – how's it done?
Quite simply, by design. The ZX80 reduced the chips in a working computer from 40 or so, to 21. The ZX81 reduces the 21 to 4!

The secret lies in a totally new master chip. Designed by Sinclair and custom-built in Britain, this unique chip replaces 18 chips from the ZX80!

Kit or built – it's up to you!

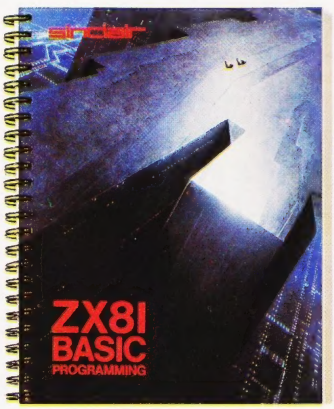
The picture shows dramatically how easy the ZX81 kit is to build: just four chips to assemble (plus, of course the other discrete components) – a few hours' work with a fine-tipped soldering iron. And you may already have a suitable mains adaptor – 600 mA at 9 V DC nominal unregulated (supplied with built version).

Kit and built versions come complete with all leads to connect to your TV (colour or black and white) and cassette recorder.

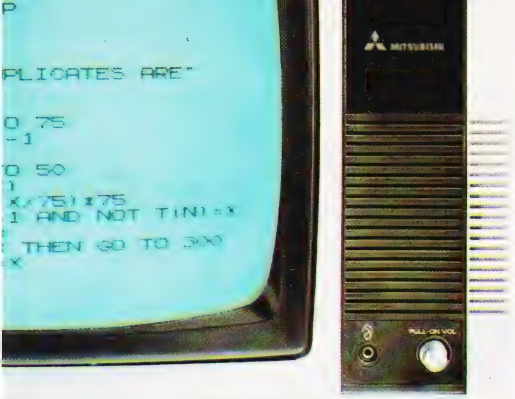


Proven micro-processor, new 8K BASIC ROM, RAM – and unique new master chip.

New BASIC manual



Every ZX81 comes with a comprehensive, specially-written manual – a complete course in BASIC programming, from first principles to complex programs.



If you own a Sinclair ZX80...

The new 8K BASIC ROM used in the Sinclair ZX81 is available to ZX80 owners as a drop-in replacement chip. (Complete with new keyboard template and operating manual.)

With the exception of animated graphics, all the advanced features of the ZX81 are now available on your ZX80 – including the ability to drive the Sinclair ZX Printer.

Coming soon- the ZX Printer.

Designed exclusively for use with the ZX81 (and ZX80 with 8K BASIC ROM), the printer offers full alpha-numerics across 32 columns, *and* highly sophisticated graphics. Special features include COPY, which prints out exactly what is on the whole TV screen without the need for further instructions. The ZX Printer will be available in Summer 1981, at around £50 – watch this space!

16K-BYTE RAM pack for massive add-on memory.

Designed as a complete module to fit your Sinclair ZX80 or ZX81, the RAM pack simply plugs into the existing expansion port at the rear of the computer to multiply your data/program storage by 16!

Use it for long and complex programs or as a personal database. Yet it costs as little as half the price of competitive additional memory.

How to order your ZX81

BY PHONE – Access or Barclaycard holders can call 01-200 0200 for personal attention 24 hours a day, every day. BY FREEPOST – use the no-stamp-needed coupon below. You can pay by cheque, postal order, Access or Barclaycard. EITHER WAY – please allow up to 28 days for delivery. And there's a 14-day money-back option, of course. We want you to be satisfied beyond doubt – and we have no doubt that you will be.

New, improved specification

- Z80 A micro-processor – new faster version of the famous Z80 chip, widely recognised as the best ever made.
- Unique 'one-touch' key word entry: the ZX81 eliminates a great deal of tire-some typing. Key words (RUN, LIST, PRINT, etc.) have their own single-key entry.
- Unique syntax-check and report codes identify programming errors immediately.
- Full range of mathematical and scientific functions accurate to eight decimal places.
- Graph-drawing and animated-display facilities.
- Multi-dimensional string and numerical arrays.
- Up to 26 FOR/NEXT loops.
- Randomise function – useful for games as well as serious applications.
- Cassette LOAD and SAVE with named programs.
- 1K-byte RAM expandable to 16K bytes with Sinclair RAM pack.
- Able to drive the new Sinclair printer (not available yet – but coming soon!)
- Advanced 4-chip design: micro-processor, ROM, RAM, plus master chip – unique, custom-built chip replacing 18 ZX80 chips.

sinclair ZX81

Sinclair Research Ltd,
6 Kings Parade, Cambridge, Cambs.,
CB2 1SN. Tel: 0276 66104.
Reg. no: 214 4630 00.

To: Sinclair Research Ltd, FREEPOST 7, Cambridge, CB2 1YY. **Order**

Qty	Item	Code	Item price £	Total £
	Sinclair ZX81 Personal Computer kit(s). Price includes ZX81 BASIC manual, excludes mains adaptor.	12	49.95	
	Ready-assembled Sinclair ZX81 Personal Computer(s). Price includes ZX81 BASIC manual and mains adaptor.	11	69.95	
	Mains Adaptor(s) (600 mA at 9 V DC nominal unregulated).	10	8.95	
	16K-BYTE RAM pack(s).	18	49.95	
	8K BASIC ROM to fit ZX80.	17	19.95	
	Post and Packing.			2.95

Please tick if you require a VAT receipt ☐ **TOTAL £** _____

*I enclose a cheque/postal order payable to Sinclair Research Ltd, for £ _____

*Please charge to my Access/Barclaycard/Trustcard account no.

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*Please delete/complete as applicable. Please print.

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Address _____

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FREEPOST – no stamp needed. COT07

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This is your last chance to apply for the few remaining spaces at the Computing Today Seminar. Demand for tickets for this day of lectures on improving your programming has been high but there are still a few seats left so apply NOW! If you miss this you'll have to wait until we run the next one, which may well be on other topics. If you seriously want to improve your programming, and who doesn't, then book today.

The registration fee includes refreshments in both the morning and afternoon, your midday meal AND a set of lecture notes and other relevant information. At just £38.95 this represents excellent value for money, it's almost bound to cost more next year.

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Please enclose an SAE in case we have to return your cheque.

Programme

9.30	Seminar Registration
10.00 - 11.00	Elegant Programming Techniques
11.00 - 11.30	Break for Coffee
11.30 - 12.30	Information Storage and Retrieval
12.30 - 14.00	Lunch
14.00 - 15.00	Machine Coding Within BASIC
15.00 - 15.30	Break for Tea
15.30 - 16.30	Question and Answer Forum
17.00	Seminar closes

BUSINESS NEWS

DATA SAFARI

For those of you who actively hunt down data, capture it and return it to the big white mainframe, a new product has been developed. Called the Termipet, it has a long and convoluted history. In the beginning, O best beloved, there was a company called MSI Data International who made a hand-held data capture terminal called the MSI 77. It trapped information through its keyboard or a bar code wand, stored it away in 4K of memory and, at a later time, released it into a mainframe or other such processor. A firm called Mektronic Consultants now appears, takes the MSI 77 and interfaces it to the Commodore PET, thus producing a relatively low-cost system for small retailers and others with a data capture requirement. Mektronic only make the interface so now enter Catlands Information Systems who take up the distributorship of the product. Several options exist for the system including expanded memory and an acoustic coupler to allow information to be sent over the telephone lines. The price for the Termipet is £795, and a complete system including PET, discs and printer will set you back about £2,600. Termipet information can be obtained from Mektronic Consultants, Linden House, 116 Rectory Lane, Prestwich, Manchester M25 5DB or from Catlands at Harrison Building, Green Lane, Wilmslow, Cheshire. Telephone numbers are 061-798 0803 and 0625 527166 respectively. Information on MSI's range of data capture terminals can be found by writing to Data House, St Ives Road, Maidenhead, Berks SL6 1QX or by ringing 0628 33121.

AND THEN THERE WERE THREE!

Not content with producing both an M One and an M Two computer for the small and medium sized business markets, LSI Computers have added the M Three. Developed at a cost of approximately £1 million and aided by a 25% Government grant, it is aimed at the top end of the personal/small business market. The system is based around a Z80 CPU with 64K of RAM, twin double density 5¼" floppies and a VDU all built into a desktop cabinet. The VDU features 14 programmable functions and the 5¼" drives can be replaced with 8" ones if the extra storage is required. Software runs under the CP/M operating system and a variety of applications programs are available. A Centronics interface allows the connection of a printer and there are two RS 232 interfaces available for the connection of a second system or a VDU. Prices start at £3,000 with 5¼" drives and rise to £3,500 for the hardware. An extra £500 will purchase the first applications program. Full details from LSI Computers at Copse Road, St Johns, Woking, Surrey.

PRESTEL'S PRICING

British Telecom have decided to raise the charges for using their Prestel service for the first time in 21 months. The new rates mean that from July 1st the unit charge will rise to 4p, the time remains at one minute during the Standard Rate period. The time allowed during the cheap rate period is actually increased to four minutes, cancelling out the price increase for the domestic user. Prestel is now served by 18 regional information retrieval centres and some 62% of telephone subscribers can make a local call connection. They have decided not to introduce the peak rate charge or increase the quarterly business user charge during 1981. One of the new range of Prestel adaptors that we have reported on in the recent past, the Ayr Viewdata product, has moved its production into a new factory. The new address is Ayr Viewdata, 2 Canada Road, Byfleet, Surrey.

EDUCATIONAL CONFERENCE

A one-day conference on 'Microcomputers in Educational Technology' has been organised by the Brent Education Authority and Kilburn Polytechnic and will take place on Thursday July 2nd at Kilburn Polytechnic. The conference is intended to stimulate interest and provide information for concerned parties. Software demonstrations will be given by MUSE and there will be a total of eight speakers on various aspects of the subject. The cost is a very reasonable £2.50 per person, not including lunch, so if you are interested book quickly as space is limited. More information and booking details are available from Mr F Daly at Kilburn Polytechnic, 373 Edgware Road, Colindale, London NW9 or ring him on 01-205 2517.

TERMINAL VIEWPOINT

A new, low-cost, dumb terminal is being introduced by ADDS and marketed by Terminal Display Systems. Called Viewpoint it will sell for £444, unless you manage to snap up one of the first 500 in which case it will only cost £344. Features include a detached keyboard, tilting screen, highlighting and exchangeable character sets. It certainly appears to offer remarkable value for money. Further technical information can be obtained from TDS at Philips Road, Whitebirk Estate, Blackburn, Lancs BB1 5TH. Their telephone number is 0254 676921.

PAGES OF ROMS FOR BUSINESS

Two new products for business users of the Commodore PET have made their appearance recently. The first is the Business ROM which gives you an extra 25 BASIC commands including some very interesting screen manipulation commands and a foolproof input routine. The ROM can be fitted to 80 or 40 column PETs and it costs £120. The available commands are too powerful and numerous to list here but we hope to review the product soon. The second new release is the ROM Pager, a simple PCB which fits into the ROM socket on the main board and allows up to eight ROMs — Toolkit, Business ROM, Wordpro etc, to be software selected. The board costs £45 and can be fitted almost as quickly as a ROM. Further information on both of these is available from Reprodesign Microcomputer Services, 131 Market Street, Chorley, Lancs PR7 2SG or you can ring on 02572 78376. The manual for the Business ROM is available separately at £2.50 if you want a closer look.

PROGRAM POWER

LUNAR LANDER SUPREME(16K/B/G) – classic spacecraft landing simulation. Short, medium & long-range scans show planet surface in varying detail. Continuously updated STATUS REPORT gives vertical, horizontal & relative velocity, altitude, fuel level, G factor & surface scan for suitable landing site. 8 skill selections. Brilliant graphics. £9.95

STARTREK II(32K G B) – enthralling, real time version from our Invasion Earth author, using M/C code sub-routines to great effect. Special features include larger galaxy, shielded homing warheads (fired by Klingons), time slots & non stop action. £9.95

INVASION EARTH(MC/G) – New improved version! 4 complexity ratings. 10 overall speeds. Variable shot speeds & alien descent rate. 4 invader types. Intelligent homing, exploding, angled, direct, multiple warhead & radio-jamming missiles. £8.95

INVASION EARTH(MC) – as above with SOUND EFFECTS using AY-3-8910 CHIP. £10.95

"NASCOUNT" -PERSONAL FINANCE(16K/MC) – Make life simpler with this finance planner. Budget income/expenses month by month and highlight likely surpluses & deficits. Can be used to check bank account & record past income/expenses. 50 entries each period. Five digit codes with analysis by code & sub-code. Calculate cumulative cash flow to specified month end. Output to cassette & printer. £9.95

CONSTELLATION(16K/B) – Turn your screen into a telescope & view the stars from any point in the Northern Hemisphere at any time & date. Display stars by magnitude, identifying number or constellation. The telescope can be raised & lowered, zoomed in & out. Also output of star map to printer. £6.95

** NASCOM 1 – Cottis Blandford cassette interface for N2 format, reliability & fast load £14.90.
B = Nascom BASIC (State Tape BASIC if required)
MC = Machine Code G = Nascom Graphics 8K RAM required unless otherwise stated.
ALL PROGRAMS SUPPLIED ON CASSETTE IN CUTS/KANSAS CITY FORMAT

NASCOM 1 & 2

WORDEASE WORD PROCESSOR(MC) –
Professionally written 4K word processor - 14 line window on text buffer & extensive on-screen editing facilities. Insert & delete characters, lines & paragraphs. Text manipulation – copy from one section of text to another, or read in additional material from tape to any point in the text. FIND & REPLACE facility. Text buffer size according to available memory.
Exceptional formatting capability - commands embedded in text allow complete flexibility e.g. variable tab position, indent, line length & page length. Use of up to 10 'MACROS' permits automatic inclusion of headings, footings & other 'text repeats', & also automatic page numbering.
Output to printer – can vary character delay, inhibit line feeds & force upper case if required.
An extensive manual is supplied (itself prepared on Wordease). (MANUAL ONLY – £1/refundable against program order). **£25.00**

VORTEX (MC)(State 16/32 or 48K) – Speed up your display of pixel graphics. Cassette holds 29 separate routines to be called from BASIC. Extensive instructions and examples supplied. Give your programs that pofessional touch! £8.95

CLUB MEMBERSHIP(32K/B) – Create a file of 200 Members – containing Name, Address, Date of Joining, Number, Remarks, Paid or not. Amend or Delete. Comprehensive search & sort routines. Partial or complete listings. Output to cassette & printer. £9.95

Super Startrek (16K/B)	£6.95
Alien Labyrinth (16K/B/G)	£6.95
Super LIFE (MC/G)	£6.95
Cliff Invasion (B/G)	£6.95
Space Fighter (B/G)	£5.95
Cowboy Shoot-out (MC/G/Sound)	£4.95
Fruit Machine (B/G)	£4.95
Road Race (MC/G/Sound)	£4.95
Labyrinth (B/G)	£4.95
Renumber (MC)	£4.95
WIRRAL PILOT V4.0	£12.50

MAGAZINE – In next issue of C.T we hope to announce the publication date of a new magazine for NASCOM. Initially, it will be a one-off with emphasis on high quality information. Features will include News from Clubs & Schools & letters to the Editor. Contributors/Advertisers – please write to the Editor c/o Program Power.

MUSIC BOX

Now you can make music with NASCOM. Easy to follow program allows you to key in old favourites or have fun composing your own tunes. 7 octave range with staccato option. 9 tempos. Set note duration or tap in rhythm as required.
Comprehensive editing. Delete, insert or amend notes. Single-step forward & backwards through tune. Add new lines within declared array size.
The program includes tape generating & play-back routines & is supplied with 2 demonstration melodies & instructions for connecting your Nascom to an amplifier/speaker such as our unit below.
Min. 16K required – please state T4 or Nas-sys/2 or 4 MHz. Only £9.95

AUDIO INTERFACE BOARD/SPEAKER

Compact & ready assembled, suitable for use with "MUSIC BOX" & other 'sound effects' programs. 3 simple connections. Complete with instructions on programming for sounds. £10.75

AY-3-8910 SOUND CHIP

Program up to three independent channels with music & sound effects! Supplied with detailed write-up. £8.50

SOUND CHIP INTERFACE BOARD – Using the PIO, program up to four sound chips at once i.e. 12 separate programmable sounds. Each board contains an interface allowing a further board to be attached. Only simple link changes required. Connect to amplifier/speaker such as our unit above. £13.50

SOUND CHIP DEMO PROGRAM – First mode gives direct entry to chip registers, making experimentation simple & thus rapid appreciation of chip's potential. Second mode turns keyboard into 7 octave 'piano' displaying state of registers & notes (up to 3) being played. £5.95

60 page Data Manual (no VAT) £2.25

BOARD GAMES

Games Graphics ROM/Adaptor	£15.00
SARGON CHESS - Book (no VAT)	£2.50
- with program	£19.50
Book/program/ROM/Adaptor	£35.00
Draughts (B/G) *	£7.95
Backgammon (16K/B/G) *	£7.95
(* state ORD. or ROM version)	

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Sae for FULL CATALOGUE (Now over 50 items!)
PROGRAM POWER
5, Wensley Road,
Leeds LS7 2LX
Telephone (0532) 683186

MORE POWER FOR YOUR PET™.....!!

Business ROM: Simply plug 'Business ROM' into your CBM/PET™ microcomputer, and gain over 25 new BASIC commands — designed to make the PET easier to use, and more powerful, for business use. Beginners as well as experienced software houses will welcome this professional tool. Your programs will be much shorter, more reliable, run faster, be easier to use, etc. Features include:– Turnkey operation; Completely foolproof input routines; Disk handling made simple; Superb screen manipulating, (send screens full of information to memory or disk or printer with single word command); and many more. All these machine code routines are available all the time PET™ is switched on; and they are called by properly tokenised keywords. Price £120 plus VAT. Extensive User Manual available separately for £2.50 (allowable against subsequent purchase). Send for free leaflet giving full details of this exciting new ROM.

BUSINESS ROM REALLY DOES MEAN BUSINESS!!

ROM Pager: A small board that fits neatly inside your PET™, and allows up to 8 different ROMs or EPROMS to be plugged in at one time. Fitted in seconds (it just plugs in), it is fully software controlled — you can even change ROMs from within a program! Now you can have VISICALC, Business ROM, WORDPRO, etc, all plugged in at once. £45 plus VAT.

EPROM Programmer: The programmer that has all the tools of a development system. Allows all common types of EPROM to be programmed. The Programmer's Programmer! £250 plus VAT.

Text Processor: Using the power of the Business ROM means we can offer this fast, easy-to-use Text Processor for only £100 plus VAT. It gives you all the facilities to write and edit text of any type; extract and join files; etc. Reprodesign use this program in a PET™ linked to a phototypesetter to produce artwork like this advert!!! They could do the same for you.

Other PET™ products: Floppy Disks, Continuous stationery (plain or printed to your details), Some top-quality American Software (eg VISICALC at £98 plus VAT), etc. Send for free catalogue. All software is Post Free.

Demonstrations/more information/advice/etc given with pleasure — just contact us.

JCL SOFTWARE
47 London Road, Southborough,
Tunbridge Wells, Kent.
Tel: (0892) 27454

REPRODESIGN
131 Market Street, Chorley,
Lancashire
Tel: (02572) 78376

BUSINESS NEWS

SHARP'S SOFT APPROACH

Sharp's launch of the PC3201 system into the small business market created an obvious requirement for software. Panmede Computer Services were commissioned to produce several packages and the first have now arrived. The fully integrated accounting package consists of a Sales, Nominal and Purchase Ledger together with an Invoicing system. The next product will be a Stock Control package which will, if required, link to the Invoicing software. Both the Sales and Purchase ledgers can handle some 1,600 accounts with up to 5,000 transactions per month, and the Nominal ledger caters for up to 1,500 transactions per month. To increase the capacity of the programs Sharp are bringing out a 48K memory expansion, and all the software can be upgraded to run on 8" discs when required. Full details of the packages and the system can be obtained from your local Sharp dealer or direct from Sharp Electronics (UK) Ltd at Sharp House, Thorp Road, Newton Heath, Manchester M10 9BE.

NEW HEAD FOR CRA

Ian Dunkley, best known for the Datron Micro Centre in Sheffield, has been elected as the new Chairman of the Computer Retailers' Association. The previous Chairman, Dr Tim Keen of Keen Computers, has been re-elected to the post of Vice Chairman and Ray Johnson of TV Johnson is the new Treasurer. Membership of the CRA has risen to 30 and now includes some of the biggest UK retailers. The range of services to the members is to be increased, a number of specialist groups have been set up for this purpose, in the effort to encourage more of the growing number of suppliers to join. Information on the range of services available to prospective members and the protection offered to customers who buy goods from CRA members can be obtained from the Secretary, Owles Hall, Buntingford, Herts SG9 9PL.

PRINTING WITH STYLE

More and more matrix printer manufacturers are producing machines capable of giving a high quality 'correspondence' print. The latest in this growing selection is the Sanders Media 12/7 Vario-Printer which takes the system one step further. Using a new 'infinite dot matrix' process it can produce an infinite number of type styles or graphics outputs. Up to 16 different fonts can be held on the printer at any one time and these can be intermixed under program control. The speed in high quality mode is between 30 and 90 cps, and in ordinary mode it is 200 cps. There is obviously a price to be paid for all this technology — £2,350 including the basic font and one high quality one. Information can be obtained from Real Time Developments at Caroline House, Invincible Road, Farnborough, Hants GU14 7QU or by telephoning on 0252 46213.

TANDY'S TRIPLETS

Following closely in the footsteps of Model I and Model II comes the new Tandy personal computer, Model III. Priced at £499 inclusive of VAT it is a desktop type unit complete with VDU, keyboard, 4 to 48K of RAM, printer interface and the option of twin 5¼" discs. The price is the same as was originally charged for the 4K Model I back in 1977 and the system will run any software produced by the original Level I machine or you can use the improved Level III BASIC. Tandy have a range of software and hardware for the Model III. Some of the new offerings are a daisywheel printer for £1,099 and a printer/plotter at £649. Their version of the Sharp PC 1211 is currently priced at £119 with the cassette interface at £17.95 but they have yet to introduce the combined cassette/printer cradle that makes the system so delightful to use. For more information on any of Tandy's products drop in to your local store or write to Tandy Corporation, Tameway Tower, Bridge Street, Walsall, West Midlands WS1 1LA.

A NICE PAIR

News of two new printers from Qume and one from Daisy Systems came just too late for inclusion in last month's Buyer's Guide so here are the vital details. The Daisy Systems M50 is being marketed by Peripheral Hardware and runs at 50 cps for text and up to 65 cps for plotting. The printwheel is of the plastic daisy type and is fully interchangeable with the many fonts currently available. Further information and prices from Peripheral Hardware at Armfield Close, West Molesey, Surrey or ring on 01-941 4806. The second batch of printers come from the Qume organisation and one of the distributors is ISG Data Sales of Windsor. The Sprint 7 model and its slightly more powerful brother, the Sprint 9, are both daisywheel types with printing speeds of between 45 and 55 cps. More detailed information from Mark Jordan at ISG Data Sales, Unit 9, Fairacres Industrial Estate, Dedworth Road, Windsor, Berks or telephone him on Windsor 57955.

CP/M INDEX

The second edition of the Small Systems Group CP/M Software Index is now available, listing some 740 programs from 248 suppliers. Growth in the market is reflected by the 2.4 times increase in size of the Index since last year. It is divided into five major categories: Systems Software, General Applications, Accounting Applications, Utility Applications and Industry Specific Software. Each of these is further broken down into 76 groups. Full details of the suppliers are given with each of the entries and the list will cost you $8.00 from The Small Systems Group, Box 5429, Santa Monica, California 90405. Please mention where you saw this news item when you write.

Make the most of your Sinclair ZX Computer...

Sinclair ZX software on cassette.

£3.95 per cassette.

The unprecedented popularity of the ZX Series of Sinclair Personal Computers has generated a large volume of programs written by users.

Sinclair has undertaken to publish the most elegant of these on pre-recorded cassettes. Each program is carefully vetted for interest and quality, and then grouped with other programs to form a single-subject cassette.

Each cassette costs £3.95 (including VAT and p&p) and comes complete with full instructions.

Although primarily designed for the Sinclair ZX81, many of the cassettes are suitable for running on a Sinclair ZX80 – if fitted with a replacement 8K BASIC ROM.

Some of the more elaborate programs can be run only on a Sinclair ZX Personal Computer augmented by a 16K-byte add-on RAM pack.

This RAM pack and the replacement ROM are described below. And the description of each cassette makes it clear what hardware is required.

8K BASIC ROM

The 8K BASIC ROM used in the ZX81 is available to ZX80 owners as a drop-in replacement chip. With the exception of animated graphics, all the advanced features of the ZX81 are now available on a ZX80 – including the ability to run much of the Sinclair ZX Software.

The ROM chip comes with a new keyboard template, which can be overlaid on the existing keyboard in minutes, and a new operating manual.

16K-BYTE RAM pack

The 16K-byte RAM pack provides 16-times more memory in one complete module. Compatible with the ZX81 *and* the ZX80, it can be used for program storage or as a database.

The RAM pack simply plugs into the existing expansion port on the rear of a Sinclair ZX Personal Computer.

Cassette 1 – Games

For ZX81 (and ZX80 with 8K BASIC ROM)

ORBIT – your space craft's mission is to pick up a very valuable cargo that's in orbit around a star.

SNIPER – you're surrounded by 40 of the enemy. How quickly can you spot and shoot them when they appear?

METEORS – your starship is cruising through space when you meet a meteor storm. How long can you dodge the deadly danger?

LIFE – J. H. Conway's 'Game of Life' has achieved tremendous popularity in the computing world. Study the life, death and evolution patterns of cells.

WOLFPACK – your naval destroyer is on a submarine hunt. The depth charges are armed, but must be fired with precision.

GOLF – what's your handicap? It's a tricky course but you control the strength of your shots.

Cassette 2 – Junior Education: 7-11-year-olds

For ZX81 with 16K RAM pack

CRASH – simple addition – with the added attraction of a car crash if you get it wrong.

MULTIPLY – long multiplication with five levels of difficulty. If the answer's wrong – the solution is explained.

TRAIN – multiplication tests against the computer. The winner's train reaches the station first.

FRACTIONS – fractions explained at three levels of difficulty. A ten-question test completes the program.

ADDSUB – addition and subtraction with three levels of difficulty. Again, wrong answers are followed by an explanation.

DIVISION – with five levels of difficulty. Mistakes are explained graphically, and a running score is displayed.

SPELLING – up to 500 words over five levels of difficulty. You can even change the words yourself.

Cassette 3 – Business and Household

For ZX81 (and ZX80 with 8K BASIC ROM) with 16K RAM pack

TELEPHONE – set up your own computerised telephone directory and address book. Changes, additions and deletions of up to 50 entries are easy.

NOTE PAD – a powerful, easy-to-run system for storing and retrieving everyday information. Use it as a diary, a catalogue, a reminder system, or a directory.

BANK ACCOUNT – a sophisticated financial recording system with comprehensive documentation. Use it at home to keep track of 'where the money goes,' and at work for expenses, departmental budgets, etc.

Cassette 4 – Games

For ZX81 (and ZX80 with 8K BASIC ROM) and 16K RAM pack

LUNAR LANDING – bring the lunar module down from orbit to a soft landing. You control attitude and orbital direction – but watch the fuel gauge! The screen displays your flight status – digitally and graphically.

TWENTYONE – a dice version of Blackjack.

COMBAT – you're on a suicide space mission. You have only 12 missiles but the aliens have unlimited strength. Can you take 12 of them with you?

SUBSTRIKE – on patrol, your frigate detects a pack of 10 enemy subs. Can you depth-charge them before they torpedo you?

CODEBREAKER – the computer thinks of a 4-digit number which you have to guess in up to 10 tries. The logical approach is best!

MAYDAY – in answer to a distress call, you've narrowed down the search area to 343 cubic kilometers of deep space. Can you find the astronaut before his life-support system fails in 10 hours time?

Cassette 5 – Junior Education: 9-11-year-olds

For ZX81 (and ZX80 with 8K BASIC ROM)

MATHS – tests arithmetic with three levels of difficulty, and gives your score out of 10.

BALANCE – tests understanding of levers/fulcrum theory with a series of graphic examples.

VOLUMES – 'yes' or 'no' answers from the computer to a series of cube volume calculations.

AVERAGES – what's the average height of your class? The average shoe size of your family? The average pocket money of your friends? The computer plots a bar chart, and distinguishes MEAN from MEDIAN.

BASES – convert from decimal base 10) to other bases of your choice in the range 2 to 9.

TEMP – Volumes, temperatures – and their combinations.

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computing today

AUGUST 1981
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MICRO ASSEMBLER

The final part of our very popular machine code series on the 6502 consists of an assembler written in BASIC. While making no claims to be the most powerful package written to perform this task, it does allow high-level language programmers quick and easy access to the machine code of their computer — assuming that it is 6502-based.

PROGRAMMING LISPS!

More and more information nowadays is being held on computers in the form of lists. Our occasional series on Programming Languages takes a look at a language specifically designed for processing lists — LISP. Using special techniques to deal with the special requirements makes LISP an interesting language for the AI field as well as for data processing.

PUZZLING OVER CUBOIDS?

There would be no fun at all in producing a program that solved that most irritating of puzzles, Rubik's Cube, so we've done the next best thing. Cubik simulates the complete puzzle in flat plan on your micro. All the rules are obeyed and shifting any piece moves all the rest to their respective positions. You can even select which face to work from, change your mind, save and recall the puzzle from tape, and much more. Written in 8080 code for the Triton series of computers, the puzzle is fully flowcharted and commented for conversion to other systems. You could even add colour if you have the facility. Avoid boggling your brain and let the micro take the strain with Cubik!

EFFECTS UNLIMITED

Microlink returns with a fanfare of trumpets, or any other noise you wish to make. The interface of the month links a sound effects chip to either of the two micros used in the series, or any other that takes your fancy, and generates a veritable cacaphony of interesting noises.

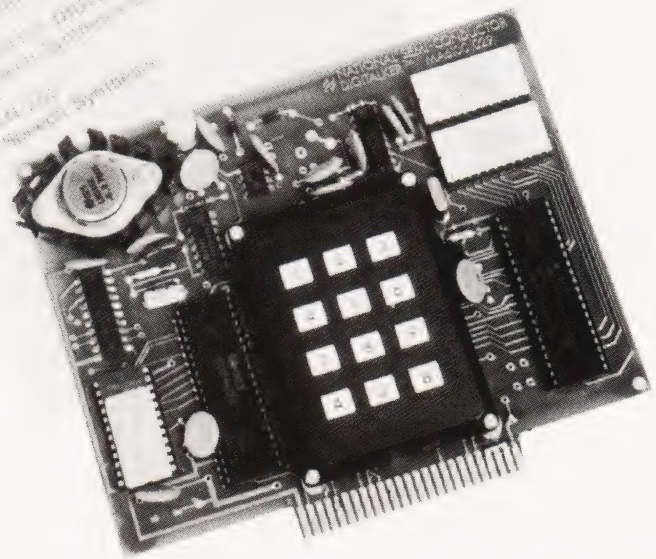
THE EUROCOMPUTER REVIEWED

In our next issue we take a look at a computer system which has truly European origins — the DAI Personal Computer. Originally developed to be used in a Dutch television computer literacy project, produced in Belgium and sold in Germany, France and the Netherlands, it offers high resolution colour graphics, programmable sound and a decent semi-compiling version of BASIC. It has been available in the UK for some months and although it has been slow to take off on the domestic market, it is gathering pace. A direct competitor to the Apple and ITT 2020, the system looks very good; but is it all perfection? Find out by reading our in-depth report in the August issue.

TALKING DIGITALLY

Henry Budgett

Another of our Special Reports, this time we look at the National Semiconductor DIGITALKER.



Probably the biggest single problem yet to be solved in the field of computer applications is the human interface. Normal communication with a computer system takes place through a keyboard unit and the computer replies are produced on a TV screen or on paper. This 'interaction' is remarkably inefficient, especially with non-computer educated users — clerks, typists, etc. The natural method of communication between two individuals is speech and, as yet, this option is not available for talking *to* the computer. Speech recognition systems do exist and articles on them have appeared in the pages of this magazine from time to time, but they are extremely expensive and use up a large amount of the processor's capacity. The channel of speech from the computer to the user does exist, at reasonable prices, even for microcomputers. This Special Report is about one of the new breed of speech generation systems, the National Semiconductor's DIGITALKER.

The Production Of Speech

The structure of human speech can be broken down into three main categories. these are voiced sounds such as the vowels; 'ar', 'ee', 'oo', etc, the unvoiced sounds like 's', 'sh' or 'f', and silence. Voiced sounds are produced by the vocal cords resonating in the airflow from the lungs. The fundamental frequency or pitch of this resonance is modified by harmonic resonances produced by the cavities of the mouth and nose. Unvoiced sounds are produced by air rushing past the vocal cords and out of the mouth, and the frequencies are again modified by the shape of the lips and the position of the tongue in the mouth. Silence can be loosely described as the absence of the other two types. It does not necessarily imply that there is no sound present.

Having defined the primary elements of any spoken sound, it can be seen that these can be reproduced electronically with a series of oscillators, filter banks and a white noise generator. Speech-like sounds may be 'synthesised' by electronic systems of this type and several are available for connection to microcomputers. The main failing of this type of speech generator is that the speech produced is not 'human': at best they lack inflection, and at worst they sound like Daleks.

There is another way of producing speech which faithfully corresponds to the original. The technique is simply to pass the analogue waveform through an analogue to digital converter and store the numbers produced. To recreate the original sound the stored numbers are fed through a digital to analogue converter, electronically the reverse process, and with suitable amplification you have the original back. The problem with this type of system is numbers — lots of them. Assuming that you are using an eight bit micro with an eight bit A to D converter, you will have to store one byte per sample. The problem arises when you realise just how many samples you have to take. Shannon's sampling theorem states that to capture a signal of a given frequency by these methods you have to sample at *twice* the frequency. This means that for speech of the quality that you get over the telephone lines (the worst acceptable) you will have to sample at 6 kHz. One second of speech at this quality will take 6 K of storage. To approach hi-fi, speech sampling will have to be done at 25 to 30 kHz. That's 30 K of RAM per second!

If you happen to be running a mainframe with the odd megabyte or 10 of disc store then that's OK: us poor micro owners have a slight problem. That problem can be overcome in a number of ways and one such system, the DIGITALKER, is now commercially available.

Talking Digits

What National Semiconductor do is to exploit the redundancy of human speech — they throw away the unnecessary information but retain the 'human' quality. Natural speech contains a lot of redundancy: when you use a telephone you are throwing away approximately two thirds of the frequency content but the person at the other end can still (generally) understand what you say. The techniques that National have come up with allow them to store one second of male speech, approximately one word, in 1200 bits, a reduction of some 100 times. Female and juvenile speakers take more space because the fundamental frequency, the pitch, of their voices tend to be higher.

The unit I borrowed from National was the complete experimental system with an on-board COPS processor, a keypad to call the stored words and some other fancy bits and pieces. The actual speech generation is done by just three chips. Two of these are 64Kbit ROMs containing the compressed, digitised speech: 144 words in all, as shown in Table 1. The third device is the Speech Processor Chip (SPC) which takes the stored speech and recreates it into an analogue waveform. The block diagram of the SPC is shown in Fig. 1. To improve the speech quality a filter circuit can be added to the analogue output of the SPC and the suggested circuit is shown in Fig. 2.

The speech produced is extremely good, it is recognisably 'human', and the characteristics of the original speaker are retained. National currently produce

four ROM sets; the one shown in Table 1, one with just the numerals, one with letters and numbers and one with a set of phrases for demonstration purposes in industry, 'Your petrol level is low', etc. Custom sets can be encoded, provided you want a few thousand!

The Micro Connection

You can, of course, connect the chip set to your micro, High Tech have one for the S100 bus. Interfacing appears to be no problem, and the suggested connections and timing diagram are shown in Fig. 3. The main control signals are as follows.

Chip Select (CS) is taken low to enable the SPC. It only needs to be low while a command is being issued, and can be tied low if the device is to be permanently enabled.

The eight data lines (SW1-8) are used to carry the binary address of the required word from the micro to the SPC.

Command Select (CMS) controls the type of operation that is to occur. If the line is set high then the interrupt is reset, and if the line is taken low then, as well as resetting the interrupt, the speech sequence will be initiated.

The Write Strobe (WR) latches the address on the eight data lines into an internal register. It is effectively the 'strobe' that must be supplied by the micro. The timing sequence is given in Fig. 3. If a new sequence command is issued while a sequence is being produced, the new command will start immediately, overwriting the current one.

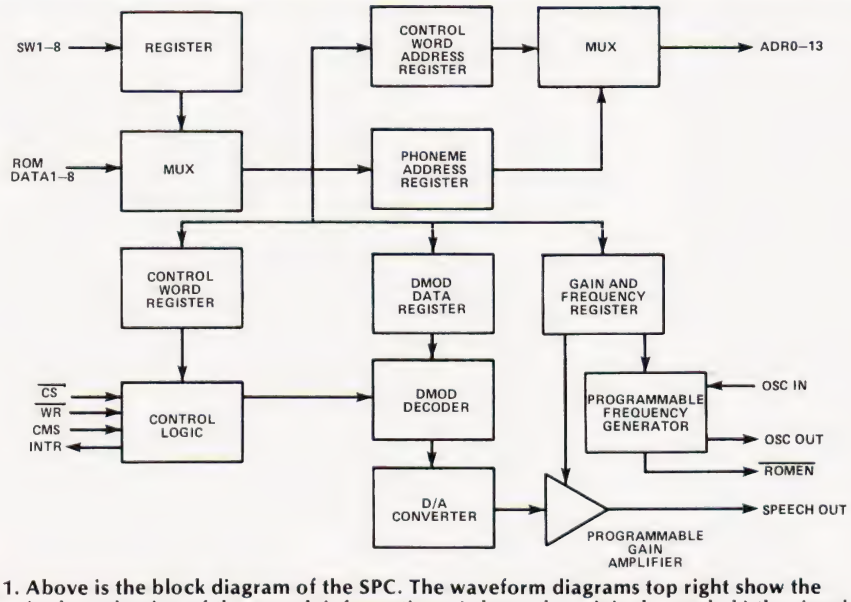
Data from the speech ROMs is carried to the SPC on the eight-bit data bus, pins RDATA1-8.

To signal the completion of the current sequence the interrupt line (INTR) goes high. The next valid command will clear it to the low state. To avoid overwriting the current sequence this line should be sensed by the micro and no new commands issued until it goes high.

The address of the speech sequence in the ROM is sent out from the SPC on the 14-bit bus ADR0-13. If you wish to conserve power the ROM itself may be enabled by the line ROMEN driving a transistor switch which controls the power supply to the ROM.

Word	Keyboard Address	8-Bit Binary Address SW8 SW1
THIS IS DIGITALKER	000	00000000
ONE	001	00000001
TWO	002	00000010
THREE	003	00000011
FOUR	004	00000100
FIVE	005	00000101
SIX	006	00000110
SEVEN	007	00000111
EIGHT	008	00001000
NINE	009	00001001
TEN	010	00001010
ELEVEN	011	00001011
TWELVE	012	00001100
THIRTEEN	013	00001101
FOURTEEN	014	00001110
FIFTEEN	015	00001111
SIXTEEN	016	00010000
SEVENTEEN	017	00010001
EIGHTEEN	018	00010010
NINETEEN	019	00010011
TWENTY	020	00010100
THIRTY	021	00010101
FORTY	022	00010110
FIFTY	023	00010111
SIXTY	024	00011000
SEVENTY	025	00011001
EIGHTY	026	00011010
NINETY	027	00011011
HUNDRED	028	00011100
THOUSAND	029	00011101
MILLION	030	00011110
ZERO	031	00011111
A	032	00100000
B	033	00100001
C	034	00100010
D	035	00100011
E	036	00100100
F	037	00100101
G	038	00100110
H	039	00100111
I	040	00101000
J	041	00101001
K	042	00101010
L	043	00101011
M	044	00101100
N	045	00101101
O	046	00101110
P	047	00101111
Q	048	00110000
R	049	00110001
S	050	00110010
T	051	00110011
U	052	00110100
V	053	00110101
W	054	00110110
X	055	00110111
Y	056	00111000
Z	057	00111001
AGAIN	058	00111010
AMPERE	059	00111011
AND	060	00111100
AT	061	00111101
CANCEL	062	00111110
CASE	063	00111111
CENT	064	01000000
400HERTZ TONE	065	01000001
80HERTZ TONE	066	01000010
20MS SILENCE	067	01000011
40MS SILENCE	068	01000100
80MS SILENCE	069	01000101
160MS SILENCE	070	01000110
320MS SILENCE	071	01000111
CENTI	072	01001000
CHECK	073	01001001
COMMA	074	01001010
CONTROL	075	01001011
DANGER	076	01001100
DEGREE	077	01001101
DOLLAR	078	01001110
DOWN	079	01001111
EQUAL	080	01010000
ERROR	081	01010001
FEET	082	01010010
FLOW	083	01010011
FUEL	084	01010100
GALLON	085	01010101
GO	086	01010110
GRAM	087	01010111
GREAT	088	01011000
GREATER	089	01011001
HAVE	090	01011010
HIGH	091	01011011
HIGHER	092	01011100
HOUR	093	01011101
IN	094	01011110
INCHES	095	01011111
IS	096	01100000
IT	097	01100001
KILO	098	01100010
LEFT	099	01100011
LESS	100	01100100
LESSER	101	01100101
LIMIT	102	01100110
LOW	103	01100111
LOWER	104	01101000
MARK	105	01101001
METER	106	01101010
MILE	107	01101011
MILLI	108	01101100
MINUS	109	01101101
MINUTE	110	01101110
NEAR	111	01101111
NUMBER	112	01110000
OF	113	01110001
OFF	114	01110010
ON	115	01110011
OUT	116	01110100
OVER	117	01110101
PARENTHESIS	118	01110110
PERCENT	119	01110111
PLEASE	120	01111000
PLUS	121	01111001
POINT	122	01111010
POUND	123	01111011
PULSES	124	01111100
RATE	125	01111101
RE	126	01111110
READY	127	01111111
RIGHT	128	10000000
SS	129	10000001
SECOND	130	10000010
SET	131	10000011
SPACE	132	10000100
SPEED	133	10000101
STAR	134	10000110
START	135	10000111
STOP	136	10001000
THAN	137	10001001
THE	138	10001010
TIME	139	10001011
TRY	140	10001100
UP	141	10001101
VOLT	142	10001110
WEIGHT	143	10001111

Table 1. The 144 words in the standard vocabluary. Just dial the address and out they come! Code 129, 'SS', makes anything else plural.



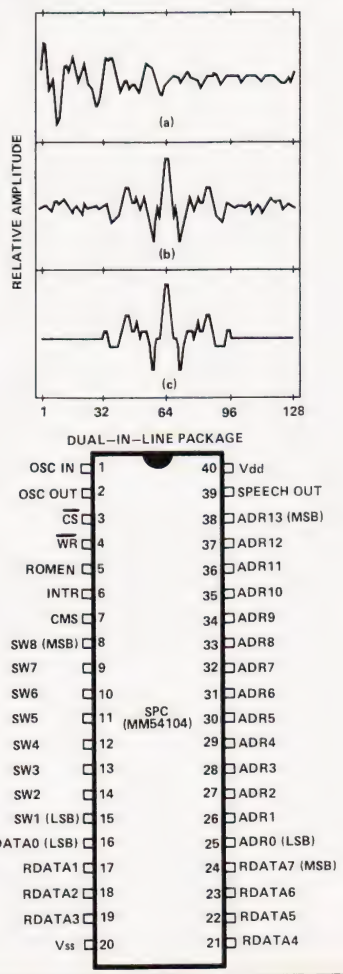
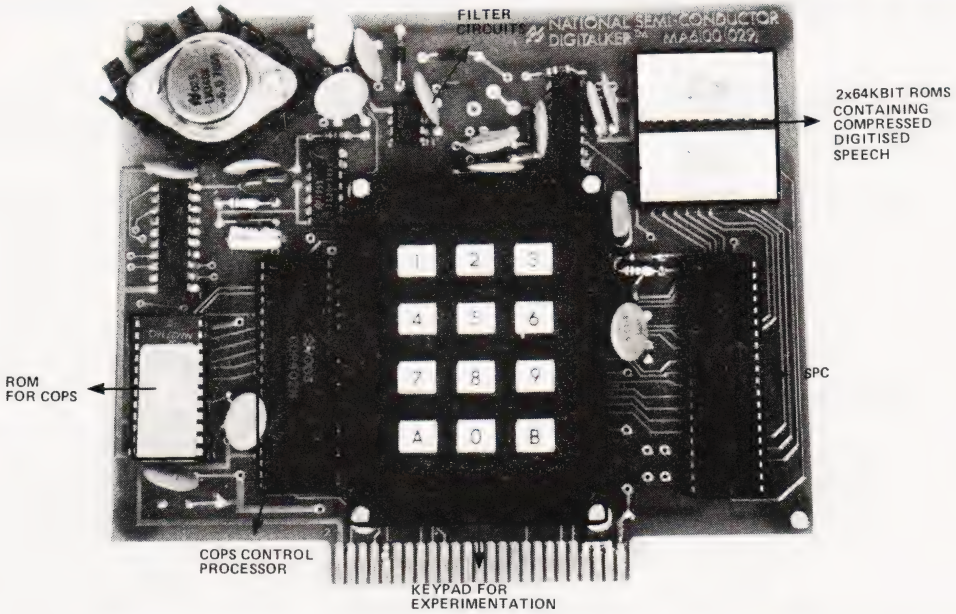


Fig. 1. Above is the block diagram of the SPC. The waveform diagrams top right show the stages in the reduction of the speech information: a) shows the original speech, b) the signal after it has had its phase angle adjusted and c) the final stage before digitization. Pin-out of the SPC is shown on the right.



The DT1000 experimentation kit with the main circuit areas highlighted.

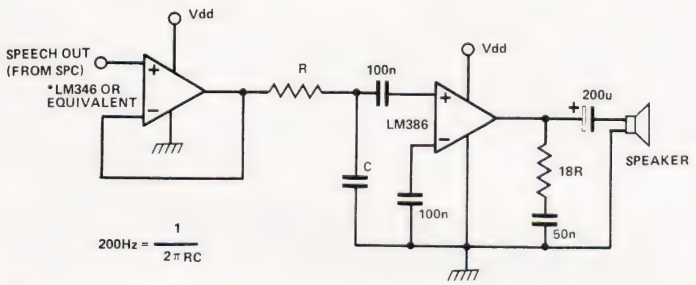


Fig. 2. The suggested minimal filter circuit.

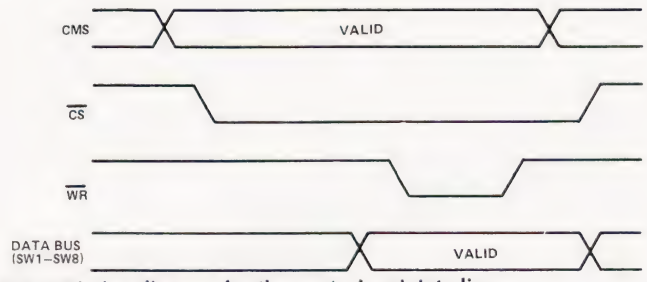


Fig. 4. Timing diagram for the control and data lines.

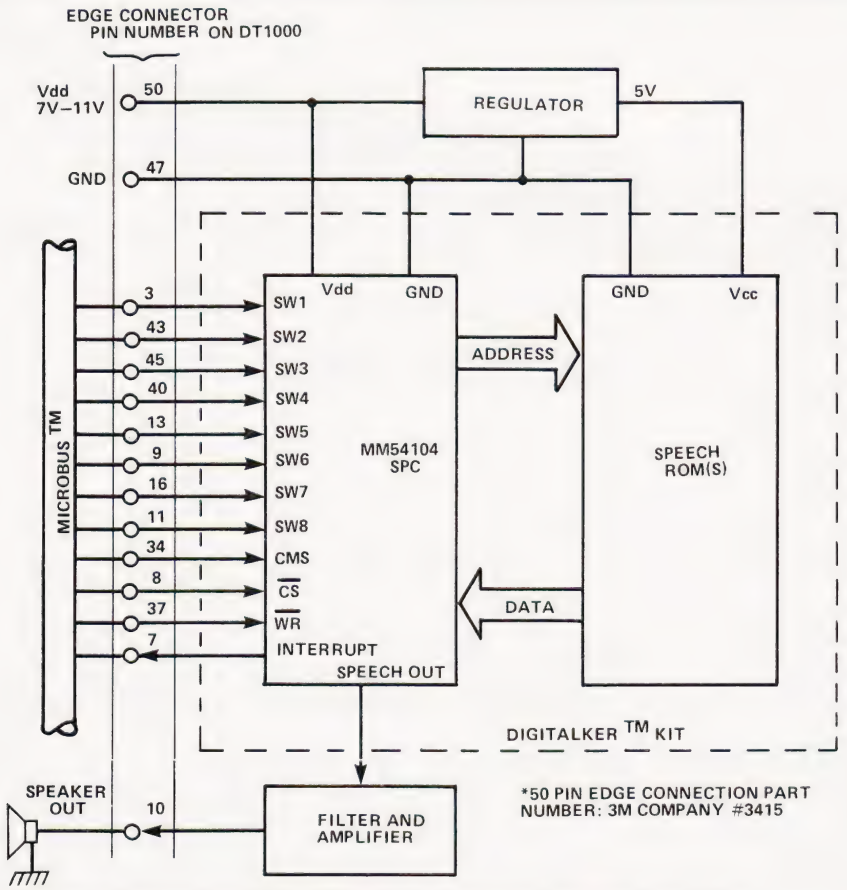


Fig. 3. Suggested connections to the SPC set. Edge connector numbers refer to the DT1000 experimentation kit.

The actual speech output from the SPC appears on the Speech Out pin. To improve the quality National suggest a filter and amplifier circuit be added. The minimum circuit is given in Fig 2, and this provides a 40 dB per octave roll-off below 200 Hz. Ideally a second filter which slightly extends the high frequency response and rolls off above an 8 kHz should be added (full details of this are given in the data sheets).

If you are intending to incorporate the SPC into your system then it is well worth getting hold of the set of data sheets from National. The relevant numbers are DT1000 for the experimental system, DT1050 for the SPC with the standard vocabulary, MM54104 which covers the way the DIGITALKER works, and AN-252 which covers speech synthesis.

The Final Word

The DIGITALKER experimental kit will set you back a hefty £316.80 but the SPC and ROMs will only cost £54.40. They are slightly hard to get hold of, as everybody seems to want one!

Many thanks to Bob Perrigo for lending me his begged, borrowed or stolen sample for the review and to Joe D'Elia of National for his help.

National can be reached at 301 Harpur Centre, Horne Lane, Bedford MK40 1TR.

UK101 - OHIO - SHARP - MICROTAN -

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BLANK removes unwanted spaces and LET from your listing.
VTAPE allows vision loading (see below for full details).
MC - a full machine code monitor.

Other words are:
FIND, LFIND, LVARS, LREPLACE, REMKIL

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NEW FEATURES: Margin Control - CHR$ Control to Printer - Faster Erase.
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TRS80-V.GENIE-and now ZX80/81

BASIC 5 - for UK101 and OHIO

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PRINTUSING, HLIN, VLIN, SCR, BLK, SET, TEST, GET, GS, GT, GO, GO$, RD, PRINTAT, INAT, WI, CWI

Graphics - HLIN, VLIN, SCR, BLK, SET and TEST allow generation and manipulation of graphics at speeds which are unimaginable in BASIC.
Formatting - PRINTUSING, PRINTAT and INAT allow total control over screen output.
Programming - GET (key), RD (READ DATA), GS & GT (GOSUB and GOTO a variable), GO & GO$ (GOTO a machine code routine), allow total program flexibility.
WI and CWI allow CEGMON users to manipulate their screen under variable control using one command, in hex or decimal.

BASIC 5 requires 2K of memory space. Availability for all CEGMON & MON02 monitors is immediate - MON01 and SYNMON soon. Supplied with comprehensive manual and demo tape. Written by P Rihan.
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* plug in on UK101 - does not use J1 expansion socket
* available as a kit or ready built from June 81

PRICES: Kit £49.95, Built £64.95 (both + £1.50P&P)
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* supports all 6502 mnemonics and addressing modes
* features code editing/deleting
* full error messages
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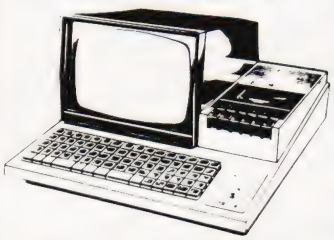

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R E Wellings Thomas

Operator error can cause even the best program to crash. We show you how to prevent most of the common mistakes getting through.

The recent rapid proliferation of microcomputers has meant that more and more people totally untrained in their use will find themselves trying to communicate with, or through, a machine. Such applications, already clearly established in computer-aided learning (CAL), computer-assisted medical diagnosis, or computerised help for the handicapped, will expand rapidly. What about computer-aided bank loans, insurance, travel, or even gardening? All of these situations rely on an intelligent dialogue between the computer and the user. Current technology usually demands that the user must reply to a number of program-generated questions. A reply is normally effected by typing an answer. It is the Manual Data Entry process, the 'moment of truth' in computer-aided transactions, that is the subject of this article.

Strategies

There are two complementary strategies for data entry. The first takes a data string, whether numerical or alphabetical, and then tests it to check whether that particular input conforms to program requirements before accepting it. The second strategy takes each character, one at a time, as it is entered, checks it, and then concatenates it into a data string. BASIC supports both strategies and implements the first as the standard string INPUT statement. It is clear that this input data may be separated character by character and subsequently tested using string analysis techniques. An example is given below:

```
STATEMENT                    REMARKS
10 INPUT A$                  READ AN INPUT STRING
20 AL=LEN (A$)               FIND THE ACTUAL LENGTH OF A
30 FOR C=1 TO AL             C IS A LOOP COUNTER
40 B$ = RIGHT$ (A$, C)       FOR EACH RIGHT-HAND CHARACTER
                             (B$)
50 .....                     TEST FOR SOME CHARACTERISTIC
60 NEXT C                    LOOP
```

Line 50 would normally check to see if the ASCII value of the character fell into some acceptable range, possibly numerical. In the latter case a letter would generate an error.

It is self-evident that, in using the INPUT strategy, the whole of the data string has had to be entered before error detection can begin. Microcomputers such as the PET usually require that all characters to the right of the cursor on a screen line at the start of the BASIC string INPUT routine are read as part of that INPUT. If the INPUT occurs in the middle of a graphic display, drawn perhaps to simulate a paper pro forma in which data entry 'windows' have been placed, then the length of the string must be checked. Characters in excess of the allowable character length must then be deleted and the mutilated screen pro forma redrawn. In the example below the BASIC routine previously described has been modified to include such a routine.

```
STATEMENT                    REMARKS
 :
35 IF AL>IL THEN 70          IL = SELECTED INPUT LENGTH
 :
70 FOR C=AL TO IL
STEP-1                       LOOP COUNTER
80 PRINT "[CL]
[SPC][CL]"                   — DELETE EXTRA CHARACTER
90 NEXT C                    LOOP
100 PRINT "....."            — REPRINT PRO FORMA 'WINDOW'
```

Line 80 merely replaces the PET Cursor control characters with printable ones.

Better Strategy

The second 'character input' strategy is the better strategy because it enables remedial action to be taken as soon as a false input character is detected. It can be implemented in BASIC using the GET statement. The GET is performed almost instantaneously and will return a zero, or " ", indicating a null string, even if no key is pressed. During GET no cursor or characters are displayed and the input string is limited to one character. This means that a lengthy input string will have to be concatenated from a succession of characters before use. The ability to process individual characters before acceptance, despite cursor, keyboard and display problems, makes the use of the GET statement very attractive for properly validated data entry routines.

Data Entry Requirements

It is always good practice to think before acting. It is equally good programming practice to begin with an algorithm, often expressed in a flow chart, however simple. Let us begin by considering the algorithm given in Fig. 1. At least it is simple; it clearly indicates the order of events and divides the task into four separate parts.

The first box of the algorithm in Fig. 1 asked for the specification of the type of data entry required. Let us specify four types. Obviously further types could be added but the following input types (IT) should suit most applications.

IT = 0	allows any character or symbol
IT = 1	allows numbers only
IT = 2	allows integers only
IT = 3	allows letters only

Numerical input is often required to fall between set upper and lower limits and it would be appropriate to specify these limits here. If the data string has to fit inside a particular graphics 'window', then this input length (IL) should also be specified at this point. A typical specification might read as follows:

IT = 2
IL = 2
UL = 40
LL = −2

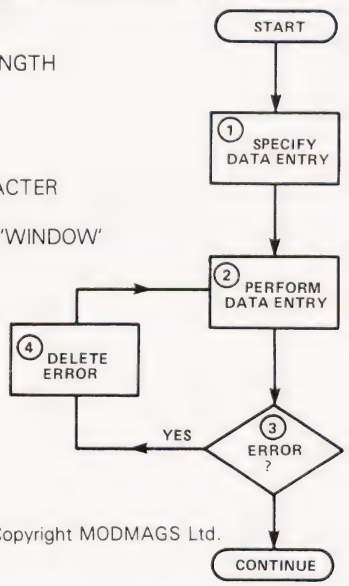


Fig. 1. The simplified data input routine.

This would mean a numerical integer input, two characters wide, having an upper limit (UL) of 40 and a lower limit (LL) of −2.

Entry Routine

Let us now develop a data entry routine based on the preferred 'character input' strategy using the BASIC GET statement. Fig. 2 shows a possible algorithm.

The first point to notice in Fig. 2 is that a decision box is used to show the detection of null values of the input character C$, which then loops control back to the GET box. Should C$ get the 'RETURN' character, ASCII Code (13), then there must be a suitable method of ending the input.

A second decision box therefore shows the detection of CHR$(13) and passes control to the end of the routine. The specification of the input is now relatively complex and a number of different error conditions could occur. It would be useful to tell an unsuccessful user why his data entry has failed to be accepted. Suitable error messages will need to be generated showing how the specified input conditions have been contravened. Notice that the only entry to the error handling routines is through the setting of an error flag. If the error flag (EF) is made to take more than the usual binary states (set and clear) then the flag itself will trigger the appropriate response in the error handling subroutines.

A second method of terminating the input routine would be for the actual input string length (AL) to equal the specified input length (IL). This technique avoids disturbing the display graphics. The PRINT statement is required because the GET statement, unlike INPUT, does *not* display characters as they are keyed in.

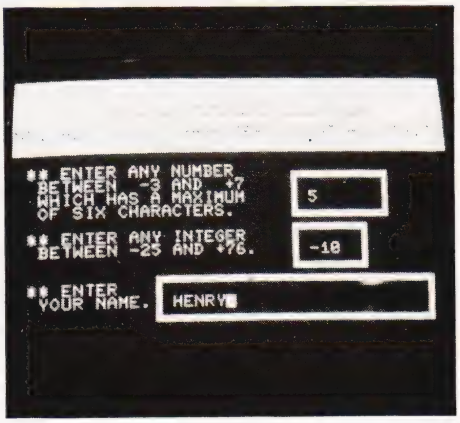
Error Detection

The actual checking of each character (C$) as it is entered is relatively straightforward once the input type variable (IT) has been specified. The flow chart in Fig. 3 shows a suitable algorithm.

First of all the ASCII code value of the character must be determined, and assigned as the value of an input variable (IV). Then the value contained in the IT variable must be used to direct program control to that area of code where IV can be compared with the ASCII codes of unacceptable characters. If a match is found then an error flag (EF) can be set. Code comparisons can be made using BASIC condition statements of the IF. . . THEN variety suitably combined with AND and OR operators. This in turn will assign a value representing the error to the error flag variable (EF), whenever the condition statements evaluate to TRUE.

If, on the other hand, the condition statements evaluate to FALSE, then the input character (C$) will be concatenated into the input string (I$). If the IT value represents numerical input the IV must be reassigned the numerical value of I$ after which limit checks can be made.

The routine below shows a much simplified version of the technique. The numerical input given in line 200 would in reality need to be expanded to include the decimal point (.) as well as the plus (+) and minus (−) signs as valid characters.



The pro forma display being filled in.

STATEMENT	REMARKS
100 GET C$	GET A CHARACTER
110 IF C$ = " " THEN 100	LOOP ON C$ = NULL VALUE
120 IV = ASC (C$)	INPUT VALUE (IV) = ASCII VALUE OF C$
130 IF IT = 1 THEN XXX	THIS SECTION DIRECTS DIFFERENT
140 IF IT = 2 THEN 200	VALUES OF INPUT TYPE (IT) TO
150 IF IT = 3 etc	RELEVANT CONDITION STATEMENTS.
:	— XXX = UNSPECIFIED LINE NUMBERS
200 IF IV < 48 OR IV > 57 THEN EF = 3	THIS EXAMPLE ALLOWS ONLY NUMBERS AS VALID CHARACTERS; OTHERWISE AN ERROR FLAG (EF) IS SET

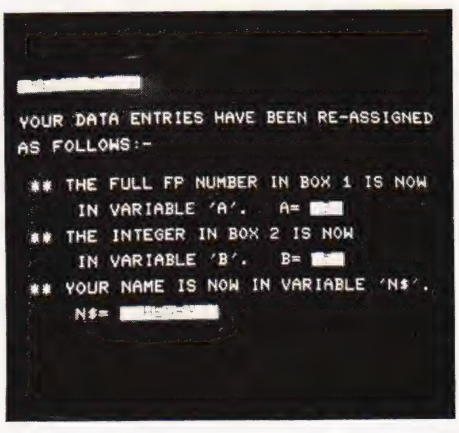
The error flag variable (EF) can be clearly seen to take different values dependent on the input type. Suitable values of EF are given below together with an appropriate error message.

FLAG VALUE	MEANING	ERROR MESSAGE
0	NO ERROR (CLEAR)	—
1	DECIMALS DETECTED	—
2	NOT AN INTEGER	ONLY INTEGERS VALID. . . PLEASE RE-ENTER
3	NOT A NUMBER	ONLY NUMBERS VALID. . . PLEASE RE-ENTER
4	NOT A LETTER	ONLY LETTERS VALID. . . PLEASE RE-ENTER
5	OUT OF LIMITS	OUT OF LIMITS . . . PLEASE RE-ENTER

Handling Errors

The aim of error handling routines should be to retain program control of input and to restore the input display to the condition it was in before the error occurred. Error messages will make the program 'user friendly' if handled in a sympathetic way. Such messages are best removed once they have been read. The algorithm given in Fig. 4 summarises a suitable method.

Erasure merely means overprinting the display with spaces. There are two cursor resets and there are two ways of doing it: either by printing cursor control characters or alternatively by looking into the operating system and finding out where cursor position bytes are held and poking them back. Of course we have to PEEK into the right location *before* we start the input routine at all. So, we



When all the entries have been completed the program displays the final result. At this point only is the RUN/STOP key enabled.

should amend Fig. 2 to show a "FIND CURSOR" box between "START" and the "GET CHARACTER C$" boxes.

The Moment of Truth

The requirements of data entry are such that the program must be able to cope with idiotic entries such as typing letters when numbers are required, or inadvertently keying RETURN or other control keys without aborting a program halfway through. Inevitably this involves the checking and validation of all data entry characters, even though this may limit the speed of typing if written in BASIC. In the final analysis an input, once accepted as reasonable by the program and subsequently accepted by the user, although actually incorrect, will be processed as valid data. The error may or may not be significant but garbage in nearly always results in garbage out. Well validated input will help to reduce the incidence of garbage input but will *not* eliminate it.

Size

For a program segment to be commonly used it should be relatively short, especially as the present generation of microcomputers is limited in its free memory capacity. In its smallest available form (Tiny-Mander), the complete routine occupies less than 1K. The heavily commented (Maxi-Mander) listing offered in this article occupies a massive 5.5K and is intended *only* as a program for study. The removal of REM statements will reduce it to 1.3K in which form it could be used directly.

PET Character Set

All the graphics and cursor control characters have been put into the CT standard format: readers who are unfamiliar with the system are referred to last month's feature, 'Programming Standards'.

PET Operating System

The 6502 used in the PET allows zero page addressing, a particularly fast and compact method for storing information, and it is used by Commodore for operating system variables. Zero page merely means the first 256 bytes of memory, which needs only one byte to address. Explanation of this area of the memory map is given in some versions of the PET User Handbook, and in Nick Hampshire's book, 'The PET Revealed'. The New ROM PET uses Page zero much more effectively than the old ROM machines in which many of the variables spill over into Page 2 (Page 1 being used for other things).

Examination of the memory map soon shows that certain new ROM Page zero addresses hold cursor and keyboard information. These are summarised below:

OLD ROM	NEW ROM	DESCRIPTION
537-538	144-145	Hardware interrupt vector (IRQ)
525	158	No of characters in keyboard buffer
544-545	163-164	Cursor log (row, column)
551	167	Cursor on (0 = flashing cursor else off)
549	168	Cursor timing countdown
548	170	Cursor blink flag
224-225	196-197	Pointer to screen line
226	198	Position of cursor on above line (0-79)
245	216	Line where cursor lives

Owners of old ROM machines should use the alternative locations given above, taking care to check that variables take the same values as those given which are for New ROM PETs.

During trials of this routine it was thought that the cursor log in 163-169 would be the best start point and routines using the log worked most of the time. For reasons unknown inputs embedded in loops would unpredictably change the display line spacing, adding an unwanted cursor up after some types of error detection routines. This approach is therefore discarded for the moment. Variables in addresses 216 and 196-197 perform similar functions.

The screen line and cursor line need not carry the same information if cursor control characters are used. The cursor line is the actual line where the cursor lives. It may have been moved away from the screen line by cursor movement controls working relative to the screen line. If the edit keys are disabled, as they are in Mander, then either 198 and 216 or 196-198 inclusive can be used alone but in general it is safer to use the listed subroutine.

A major problem is also encountered in switching off the cursor without leaving a pixel block permanently displayed. If the cursor blink is on as the cursor is switched off then the pixel remains displayed. Much effort was devoted to looking into addresses 168 and 170 and trying to ensure that the cursor was only switched off when the cursor pixel was in the 'off' part of the blink cycle. This was partially successful but differences always occurred between cursor removal under program control such as when the maximum length was met and cursor removal by entering RETURN. This method should lead to a solution, but termination of the input routine by printing a space solved the problem very neatly at the expense of making the pro forma 'window' at least one space longer than the specified input length. For presentation aesthetics an extra space at the beginning is also needed. The cursor is best displayed, clearly isolated, in the second character position of the 'window' when inviting data entry.

Addresses 144 and 145 are pointers to interrupt service routines. By changing the contents of the low byte, 144, to 49

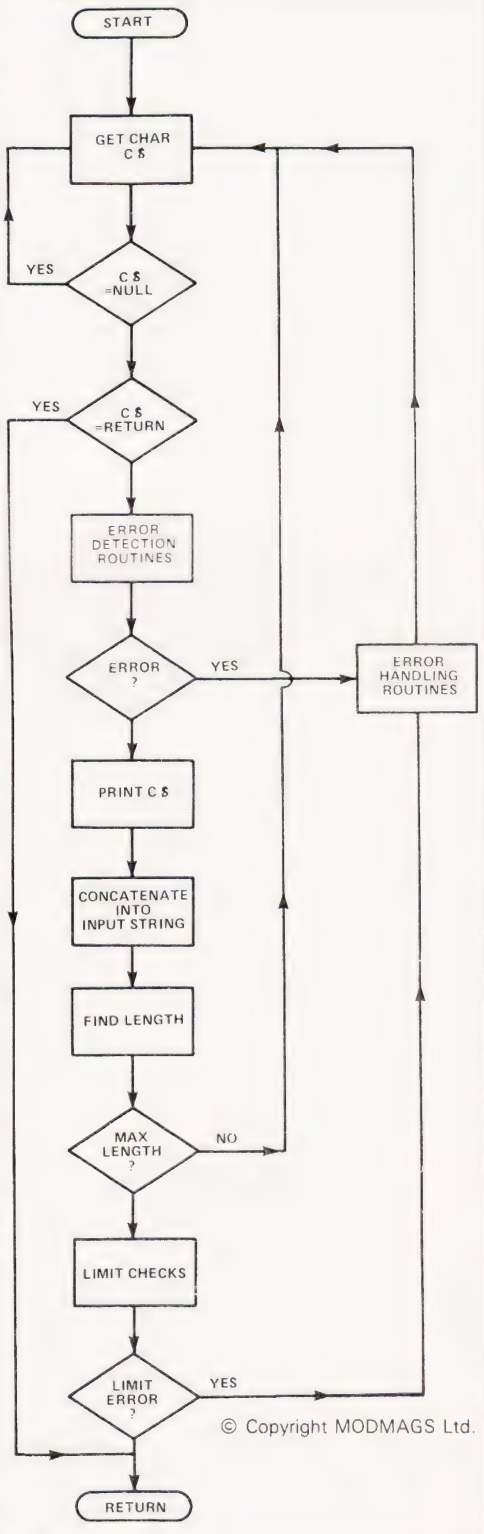


Fig. 2. A data entry routine based on the GET instruction.

(the high byte remaining unchanged) and skipping the STOP key detection routine, the STOP key is effectively disabled. The normal content of 144 is 46. Even when disabled the edit part of STOP key action still occurs and the cursor movement generates an error. This can be avoided by looking into the keyboard Peripheral Interface Adaptor PIA 1 which lives at addresses 59408-11. 59410 is the register address of the keyboard row input byte. If the fifth least significant bit is set to logical zero (which happens when the STOP key is pressed) with all the other bits remaining at logical 1, then the number 239 is generated. PEEK (59410), if equal to 239, detects STOP even when it is disabled. The conditional loop of line 640 thus avoids the edit problem.

One final point: the keyboard as a whole can be disabled by setting the least significant bit of PIA 1 register address 59411 (CB 1) to logical zero. This can be done by a POKE 59411, 60. To enable the keyboard POKE 59411, 61. This option is *not* used in Mander.

Crash Proof Input

This section is divided into four subsections:

560-590 — Set up
600-750 — Enter valid data else re-enter
760-800 — RETURN (exit routine)
830-900 — DELETE (erase)

The setting up uses the Page zero variable addresses to place the cursor, disable the STOP key and clear the buffer. To reset the STOP key a POKE 144, 46 must be included at the end of the main program or else a direct POKE must be used after the program has finished. The final way to reset is to switch off and back on. The action of all edit/cursor control keys except DELETE is ignored by the statement in lines 660 and 665. The checks, except for the length of the input string (I$), are handled in other subroutines but the necessary GOSUB's appear in this section. Condition statements pointing to exit and erasure are embedded in the section 600-750. The code is best followed using the algorithm in Fig. 2.

Alphanumerical Checks

The program lines 910 to 1080 perform the alphanumeric checks. The series of condition statements at the beginning is used for clarity but in Tiny-Mander a single statement of the type ON . . . GOTO occupies less space and executes more quickly. For numerical inputs the numbers 0-9, CHR$(48) to (57), the decimal point CHR$(46), the plus CHR$(43) and minus signs CHR$(45) are the only valid characters. The plus and minus signs must lead and only one decimal point can be allowed. When one decimal point has been detected then the error flag (EF) is given the value 1. If a second decimal point is detected then a 'non-numerical' flag is set: EF = 3. For alphabetic inputs the hyphen, CHR$(45), the apostrophe CHR$(44) and of course the full stop, CHR$(46), together with normal letters CHR$(65) to (90), must all be accepted as valid. If an invalid character is detected then EF is set to 4 meaning the character is not a letter.

Limit Checks

The limit checks are very straightforward. If IV (in its second and final use as the numerical value of the input string) is outside the specified limits (LL & UL) then an 'out of limits' error flag is set: EF = 5. In practice two other conditions must be accommodated:

(a) Once any error is detected and EF set then further checks must be skipped or EF may be reset and generate an incorrect error message.

(b) The statement VAL returns the value zero (0) for alphabetic input as well as for the numerical value zero. The ambiguity can be resolved by assuming that the numerical value of the leading character must also be a zero. The penalty is that entry formats of the type ± 0 will be rejected. A more rigourous condition statement may prove necessary in some cases but in Tiny-Mander a less rigorous con-

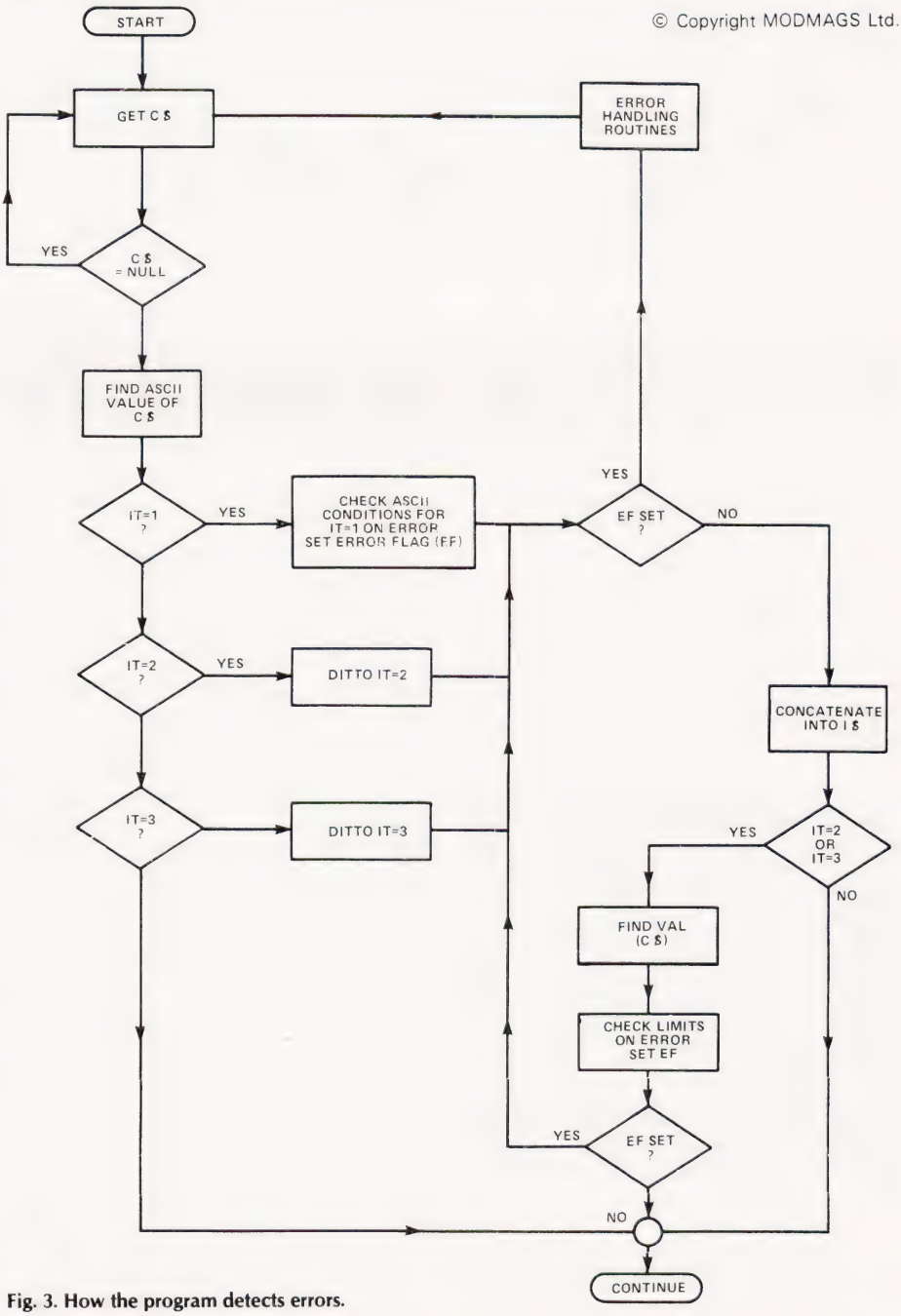


Fig. 3. How the program detects errors.

dition, requiring a zero character on its own, saves space.

Error Messages

These routines, located in program lines 1170-1400, merely implement the algorithm in Fig. 4. The error message is given the same string variable number as the error flag variable. The error strings themselves are defined in lines 410-460. Line 1190 is included to avoid conflict on null inputs and skips the error message section completely. It is a personal preference for error messages to occur as near as possible to the offending input and therefore the messages are printed two lines lower than the input. Others may feel that such messages should appear elsewhere, say at the bottom of the display. This is easily achieved by placing the cursor at the beginning of the chosen line and using a routine based on the lines 490-540 to find the cursor position variables. These new values must be POKEd back prior to printing; the error message will then be written in the new position.

Maxi-Mander

The main program beginning at line 1480 generates a pro forma window type of display for data entry. Each of the types of input is used in turn and the program demonstrates clearly how to use Mander. After each input the data variables I$ and IV are reassigned and incorporated into a results display during which the STOP key is enabled. This allows escape from the routine which would otherwise loop back to the beginning.

Conclusion

The usefulness of routines such as Mander is self-evident. In practice it might not be necessary to use all of it. Certain parts could perhaps be converted to machine code for faster more compact operation.

The educational nature of the article should have helped beginners to understand how to improve their own programming technique. The master listing has been written to be specially legible and unambiguous. The working version, Tiny-Mander, collapses all variables into the arrays I & I$. The specification variables become I1, I2, I3 and I4 instead of IT, IL, LL and UL. Tiny-Mander occupies just under 1K and is just about the maximum size that can be accommodated in a fixed memory. If called from disc storage then this limitation can be overcome.

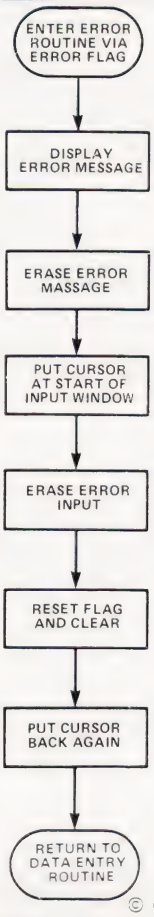


Fig. 4. Error handling after detection.

Program Listing

```
100 REM**VARIABLE ALLOCATION
110 REM**VARIABLE DIMENSIONS
120 DIM E$(6):REM**ERROR STRINGS
130 DIM C$(1):REM**INPUT CHARACTER
140 DIM I$(1):REM**INPUT STRING
150 DIM IV(1):REM**INPUT VARIABLES
160 DIM IT(1):REM**INPUT TYPE
170 DIM IL(1):REM**INPUT LENGTH
180 DIM EF(1):REM**ERROR FLAG
190 DIM CC(1):REM**CHARACTER COUNT
200 DIM CP(4):REM**CURSOR POSITION
210 DIM LL(1):REM**LOWER LIMIT
220 DIM UL(1):REM**UPPER LIMIT
230 DIM C(1):REM**COUNT
240 REM**EXPLANATION
250 REM INPUT VARIABLE (IV)
260 REM**1ST USE = ASCII OF C$
270 REM**2ND USE = VALUE OF I$
280 REM**INPUT TYPE (IT)
290 REM**IT=0 ALLOWS ANY CHARACTER
300 REM**IT=1 ALLOWS ANY FP NUMBER
310 REM**IT=2 ALLOWS INTEGERS ONLY
320 REM**IT=3 ALLOWS LETTERS ONLY
330 REM**ERROR FLAG (EF)
340 REM**EF=0 NO ERROR
350 REM**EF=1 ONE DECIMAL POINT
360 REM**EF=2 NOT AN INTEGER
370 REM**EF=3 NOT A NUMBER
380 REM**EF=4 NOT A LETTER
390 REM**EF=5 OUT OF LIMITS
400 REM**ERROR MESSAGE STRINGS
410 E$(1)="[19 SPC]"
420 E$(2)="ONLY INTEGERS VALID.."
430 E$(3)="ONLY NUMBERS VALID..."
440 E$(4)="ONLY LETTERS VALID..."
450 E$(5)="OUT OF LIMITS..."
460 E$(6)="[SPC]PLEASE RE-ENTER."
470 GOTO 1490
480 REM**INPUT SUBROUTINE LIST
490 REM**1-FIND CURSOR VARIABLES
500 FOR C=1 TO 3
510 CP(C)=PEEK(195+C):REM**POINT TO SCREEN LINE
520 NEXT C
530 CP(4)=PEEK(216):REM**198,216 = CURSOR POS
540 RETURN
550 REM**2-CRASHPROOF INPUT
560 POKE 144,49:REM**DISABLE STOP KEY
570 GOSUB 1250:REM**CLEAR LAST INPUT
580 POKE 167,0:REM**REPLACE CURSOR
590 POKE 158,0:REM**CLEAR BUFFER
600 GET C$:REM**GET A CHARACTER
610 IF C$="" THEN 600:REM**EMPTY
620 IV=ASC(C$):REM**FIND ASCII CODE
630 REM**AVOID STOP KEY EDIT ACTION
640 IF PEEK(59410)=239 THEN 600
650 REM**IGNORE EDIT KEYS
660 IF IV=17 OR IV=18 OR IV=19 OR IV=29 THEN 600
665 IF IV=145 OR IV=147 OR IV=148 OR IV=157 THEN 600
670 IF IV=20 AND CC=0 THEN 840:REM**RESET
680 IF IV=13 THEN 770:REM**RETURN
690 IF IV=20 THEN 840:REM**ERASE LAST CHAR
700 GOSUB 920:REM**CHARACTER CHECK
710 PRINT C$;:REM**PRINT CHAR
720 I$=I$+C$:REM**JOIN CHARACTERS
730 CC=LEN(I$):REM**CHECK FOR LENGTH
740 IF CC>=IL THEN 770
750 IF EF=0 OR EF=1 THEN 600:REM**LOOP
760 REM**INPUT EXIT ROUTINES
770 IF I$="" THEN 600:REM**LOOP IF EMPTY
780 IF EF=1 THEN EF=0:REM**NO ERROR
790 POKE 167,1:REM**REMOVE CURSOR
800 PRINT CHR$(32):REM**END INPUT
810 IF IT=1 OR IT=2 THEN GOSUB 1110:REM**LIMIT
820 RETURN
```

MAXI-MANDER

```
830 REM**ERASE LAST CHAR
840 IF I$="" THEN 900:REM**NIL TO ERASE
850 REM**ADJUST IF DECIMAL POINT
860 IF ASC(RIGHT$(I$,1))=46 THEN EF=0
870 PRINT"[CL][2 SPC][2 CL]";
880 CC=CC-1
890 I$=LEFT$(I$,CC)
900 GOTO 600
910 REM**3-ALPHANUMERIC CHECKS
920 IF IT=2 THEN 1000:REM**INTEGERS
930 IF IT=1 THEN 1020:REM**NUMBERS
940 IF IT=0 THEN 1080:REM**NO CHECKS
950 REM**ALLOWS ONLY LETTERS '. AND -
960 IF IV<65 AND IV<>32 AND IV<>39 AND IV<>45
    AND IV<>46 THEN EF=4
970 IF IV>90 AND IV<193 OR IV>90 AND IV>218 THEN EF=4
980 GOTO 1080
990 REM**ALLOWS ONLY INTEGERS
1000 IF IV=46 THEN EF=2
1010 REM**ALLOWS ONLY ONE DP
1020 IF IV=46 AND EF=1 THEN EF=3
1030 IF IV=46 AND EF=0 THEN EF=1
1040 REM**ALLOWS ONLY NUMBERS .+ AND -
1050 IF IV<48 AND IV<>43 AND IV<>45 AND IV<>46
     OR IV>57 THEN EF=3
1060 REM**ALLOWS ONLY LEADING + OR -
1070 IF CC<>0 AND IV=43 OR CC<>0 AND IV=45 THEN EF=3
1080 RETURN
1090 REM**4-LIMIT CHECK
1100 REM**SKIP ON ERROR
1110 IF EF<>0 THEN RETURN
1120 IV=VAL(I$)
1130 IF IV<LL OR IV>UL THEN EF=5
1140 REM**ALLOWS FOR A ZERO (0) INPUT
1150 IF IV=0 AND LEFT$(I$,1)<>CHR$(48) THEN EF=3
1160 RETURN
1170 REM**5-ERROR MESSAGE DISPLAY
1180 REM**RESETS NULL INPUT
1190 IF EF=0 AND I$="" THEN 1250
1200 PRINT"[2 CD]";E$(EF);E$(6)
1210 FOR C=1 TO 1000
1220 NEXT C
1230 PRINT"[CU]";E$(1);E$(1)
1240 REM**6-DELETE LAST INPUT
1250 GOSUB 1360:REM**REPLACE CURSOR
1260 FOR C=1 TO IL:REM**REPLACE INPUT CHARACTERS
1270 PRINT"[SPC]";
1280 NEXT C
1290 GOSUB 1360:REM**REPLACE CURSOR
1300 IV=13:REM**CLEAR DELETE
1310 I$="":REM**CLEAR STRING
1320 CC=0:REM**CLEAR CHAR COUNT
1330 EF=0:REM**CLEAR ERROR FLAG
1340 RETURN
1350 REM**7-REPLACE CURSOR
1360 FOR C=1 TO 3
1370 POKE 195+C,CP(C)
1380 NEXT C
1390 POKE 216,CP(4)
1400 RETURN
1410 REM**8-ERROR TRAP INPUT
1420 GOSUB 500:REM**FIND CURSOR
1430 GOSUB 560:REM**CRASHPROOF INPUT
1440 REM**ALLOWS USE OF DELETE
1450 IF EF=0 AND I$<>"" THEN RETURN
1460 GOSUB 1190:REM**DELETE ANY ERROR
1470 GOTO 1420:REM**NEXT INPUT LOOP
1480 REM**MAIN PROGRAM
1490 C$="":POKE 59468,12:PRINT"[CLS]";
1500 FOR C=1 TO 80:C$=C$+"[REV][SPC][OFF]":NEXT
1510 FOR C=1 TO 3:PRINT C$;:NEXT
1520 PRINT"[HOM]"
1530 PRINT TAB(8)"[REV]MANUAL DATA ENTRY ROUTINE[OFF]"
1540 PRINT TAB(8)"[CU][REV][25©#][OFF]"
1550 PRINT"[REV]NB. ALL VALID CHARACTERS COUNT AS
     DIGITS[OFF]"
1560 PRINT
1565 REM**DRAW A BOX WITH THICK LINES
1570 PRINT TAB(25)"[©,][8©"][©;]"
1580 PRINT TAB(25)
     "[REV][©!][CD][CL][©!][CD][CL][©!][OFF]";
1585 PRINT"[8©"][©!][CU][CL][©!][CU][CL][©!]"
1590 PRINT"[2 CU][SPC]**ENTER ANY NUMBER"
1600 PRINT"[2 SPC]BETWEEN -3 AND +7"
1610 PRINT"[2 SPC]WHICH HAS A MAXIMUM"
1620 PRINT"[2 SPC]OF SIX CHARACTERS."
1630 PRINT"[3 CU]"
1640 PRINT TAB(25)"[REV][©!][OFF][SPC]";
1650 LL=-3:REM**LOWER INPUT LIMIT
1660 UL=7:REM**UPPER INPUT LIMIT
1670 IL=6:REM**INPUT STRING LENGTH
1680 IT=1:REM**ALLOWS FP INPUT
1690 GOSUB 1420:REM**ERROR TRAP INPUT
1700 A=IV:REM**RE-ASSIGN INPUT VARIABLE
1710 PRINT TAB(25)"[©,][5©"][©;]"
1720 PRINT TAB(25)
     "[REV][©!][CD][CL][©!][CD][CL][©!][OFF]";
1725 PRINT"[5©"][©!][CU][CL][©!][CU][CL][©!]"
1730 PRINT"[CU][SPC]**ENTER ANY NUMBER"
1740 PRINT"[2 SPC]BETWEEN -25 AND +76."
1750 PRINT"[2 CU]"
1760 PRINT TAB(25)"[REV][©!][OFF][SPC]";
1770 LL=-25
1780 UL=76
1790 IL=3
1800 IT=2
1810 GOSUB 1420
1820 B=IV
1830 PRINT TAB(12)"[©,][25©"][©;]"
1840 PRINT TAB(12)
     "[REV][©!][CD][CL][©!][CD][CL][©!][OFF]";
1845 PRINT"[25©"][©!][CU][CL][©!][CU][CL][©!]"
1850 PRINT"[CU][SPC]**ENTER"
1860 PRINT"[2 SPC]YOUR NAME."
1870 PRINT"[2 CU]"
1880 PRINT TAB(12)"[REV][©!][OFF][SPC]";
1890 IL=23
1900 IT=3
1910 GOSUB 1420
1920 N$=I$
1930 FOR C=1 TO 1000:NEXT
1940 PRINT"[CLS][REV][SPC]RESULTS:-[SPC][OFF]"
1950 PRINT"[2 CD]YOUR DATA ENTRIES HAVE
     BEEN RE-ASSIGNED"
1960 PRINT"[CD]AS FOLLOWS:-"
1970 PRINT"[2 CD][SPC]** THE FULL FP NUMBER IN BOX 1
     IS NOW"
1980 PRINT"[CD][5 SPC]IN VARIABLE 'A'.
     [3 SPC]A=[SPC][REV]";A"[CL][SPC][OFF]"
1990 PRINT"[CD][SPC]** THE INTEGER IN BOX 2 IS NOW"
2000 PRINT"[CD][5 SPC]IN VARIABLE 'B'.
     [3 SPC]B=[SPC][REV]";B"[CL][SPC][OFF]"
2010 PRINT"[CD][SPC]** YOUR NAME IS NOW IN
     VARIABLE 'N$'."
2020 PRINT"[CD]"TAB(5)"N$=[SPC][REV]'[SPC]";
     N$"[SPC]'[OFF]"
2030 FOR C=1 TO 6000:NEXT
2040 POKE 144,46:REM**RE-ENABLE STOP KEY
2050 PRINT"[CD][SPC]** TO QUIT PRES 'STOP' KEY NOW[CD]"
2060 F$="[3 SPC]THE NEXT ROUTINE WOULD START HERE"
2070 FOR C=1 TO 5
2080 PRINT F$:GOSUB 2120
2090 PRINT"[CU]";E$(1);E$(1)"[CU]"
2095 GOSUB 2120
2100 NEXT C
2110 GOTO 1490
2120 FOR D=1 TO 500:NEXT:RETURN
```

As with the other programs in this issue the '©' symbol used in graphics statements has been printed as '©'. We would like to express our thanks to Mrs Wellings Thomas for her permission to use this material.

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7420	17p
7421	30p
7422	22p
7423	25p
7425	30p
7426	30p
7427	30p
7428	30p
7430	17p
7432	30p
7433	30p
7437	30p
7438	30p
7440	17p
7441	70p
7442A	50p
7443	112p
7444	112p
7445	80p
7446A	93p
7447A	60p
7448	80p
7450	17p
7451	17p
7453	17p
7454	17p
7460	17p
7470	36p
7472	30p
7473	32p
7474	30p
7475	38p
7476	32p
7480	50p
7481	100p
7482	84p
7483a	60p
7484	100p
7485	110p
7486	30p
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7490A	30p
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7492A	40p
7493A	30p
7494	84p
7495A	60p
7496	50p
7497	180p
74100	100p
74107	34p
74109	55p
74116	100p
74118	100p
74119	100p
74120	110p
74121	34p
74122	48p
74123	60p
74125	60p
74126	60p
74128	60p
74132	60p
74136	60p
74137	50p
74141	75p
74142	200p
74145	90p
74147	120p
74148	100p
74150	120p
74151A	50p
74153	50p
74154	90p
74155	60p
74156	60p
74157	50p
74159	120p
74160	70p
74161	70p
74162	70p
74163	70p
74164	90p
74165	90p
74166	90p
74167	200p
74170	200p
74172	300p
74173	90p
74174	75p
74175	75p
74176	70p
74177	90p
74178	100p
74180	80p
74181	160p
74182	90p
74184A	120p
74185	120p
74186	500p
74188	325p
74190	90p
74191	90p
74192	90p
74193	90p
74194	90p
74195	95p
74196	95p
74197	80p
74198	120p
74199	120p
74221	90p
74251	100p
74259	120p
74278	200p
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74285	250p
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74LS27	30p
74LS30	20p
74LS32	27p
74LS33	27p
74LS37	30p
74LS38	30p
74LS40	25p
74LS42	60p
74LS47	60p
74LS51	24p
74LS55	30p
74LS73	40p
74LS74	27p
74LS75	36p
74LS76	45p
74LS83	70p
74LS85	80p
74LS86	40p
74LS90	40p
74LS92	70p
74LS93	50p
74LS96	110p
74LS107	45p
74LS109	60p
74LS112	40p
74LS113	90p
74LS114	45p
74LS122	80p
74LS123	60p
74LS124	180p
74LS125	45p
74LS126	45p
74LS132	60p
74LS133	45p
74LS136	40p
74LS138	55p
74LS139	55p
74LS145	120p
74LS147	160p
74LS148	140p
74LS151	70p
74LS153	60p
74LS154	200p
74LS155	60p
74LS156	60p
74LS157	50p
74LS158	60p
74LS160	90p
74LS161	75p
74LS162	90p
74LS163	60p
74LS164	75p
74LS165	100p
74LS166	120p
74LS173	110p
74LS174	80p
74LS175	75p
74LS181	200p
74LS190	75p
74LS191	75p
74LS192	75p
74LS193	75p
74LS194	90p
74LS195	90p
74LS196	90p
74LS197	90p
74LS221	90p
74LS240	120p
74LS241	120p
74LS242	90p
74LS243	90p
74LS244	100p
74LS245	120p
74LS247	140p
74LS251	75p
74LS253	75p
74LS257	75p
74LS258	75p
74LS259	100p
74LS266	50p
74LS273	120p
74LS279	75p
74LS283	75p
74LS298	100p
74LS299	375p
74LS323	250p
74LS324	150p
74LS348	200p
74LS365	48p
74LS367	50p
74LS368	50p
74LS373	120p
74LS374	120p
74LS375	90p
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74S112	120p
74S114	120p
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3.276MHz	300p
3.579MHz	175p
4.00MHz	290p
4.194MHz	POA
4.43MHz	125p
5.0MHz	325p
6.0MHz	300p
6.144MHz	300p
7.0MHz	300p
7.168MHz	300p
8.00MHz	300p
8.867MHz	300p
10.00MHz	310p
10.7MHz	300p
12.0MHz	350p
16.00MHz	350p
18.00MHz	300p
18.432MHz	350p
19.968MHz	390p
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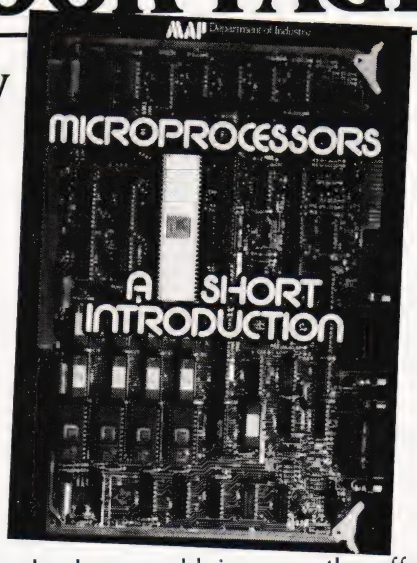
BOOK PAGE

We take a look at some of the recently published works on microcomputers.



Microprocessors: An Introduction For The Professional Layman
By Paul Kimberly, published by Hayes Kennedy
280 pages £7.95 ISBN 0 86269 000 5
Reviewed by Henry Budgett

The declared aim of this volume is that it is 'for those people who need to inform themselves of the principles and jargon involved in modern microelectronics and computer systems...'. It is refreshing to find that the book sticks to this aim throughout. The author further suggests that the book is 'not meant to be a text book, but rather a book for the briefcase, to be dipped into...', a statement with which I slightly disagree. The book would, in my opinion, make an excellent introduction for someone starting a serious computer studies course as well as for the 'professional layman'.

The first chapter leads you gently through the development of the world of computers from Babbage to IBM and beyond to the micro. Although the author is apparently English, costs are given almost throughout in dollars, the common currency of the computer business. This, I am glad to say, is one of only two Americanisms — the second is that ghastly word 'Analog', which I always thought was a science fiction magazine.

Chapter 2 examines the markets for computers and computer-related products, strictly for those who like statistics.

The next chapter concerns itself with the theory of operation and production of microelectronic devices. All the common techniques from the pn junction to MOS are briefly examined as are the various types of use to which they can be put; logic gates, memory and the like.

The book's fourth chapter declares that it will 'take a look at some of the other devices and technologies that, of necessity, surround the microprocessor...'. Basically it concerns itself with things like interface standards, transducers that can be attached, etc.

The remaining chapter of text looks at the way in which all this diverse technology can be put together for industrial or business use and should be issued free to anyone threatening to buy a micro!

The author has worked for two large computer manufacturers, and in a rare burst of insight has revealed many of the common pitfalls in the two case studies. As well as being essential reading for the businessman, this chapter would give a computer studies student considerable information on real applications, something that many of the 'standard texts' leave out.

The remainder of the book is given over to an incredibly comprehensive glossary. As well as listing in excess of 1,000 of the most common terms in computing with their definitions (I'm glad to see he got Pascal right!) there is a list of acronyms, the Greek alphabet, code conversion tables, information on logic circuits and binary arithmetic, and a bibliography of reference books. It looks as though the glossary might be a challenge to my current 'bible', Maynard's Dictionary of Data Processing.

In summary, therefore, the book meets and often exceeds the aims it formally set for itself. It would make excellent if not essential reading for anyone with the 'professional layman' tag and also lends itself as background material for a number of computer studies courses.

Microprocessors: A Short Introduction
By Eric Morgan DOE
Printed by HM Stationery Office
95 pages £5.00
Reviewed by Peter Freebrey

This book consists of 10 chapters and 5 appendices and is primarily aimed at those whose companies manufacture products which could benefit in financial or competitive terms by the inclusion of microcomputing elements.

It describes the basic building blocks that go together to make a microcomputer and throughout its pages suggests many of the applications where this new technology could improve the effectiveness of a product.

Each new step is introduced clearly and explains the 'state of the art' jargon in a manner that any intelligent newcomer will understand. Beginning with a brief discussion on microelectronics — the new technology — the reader is then given a simple and concise description of the microprocessor — the heart of the microcomputer. This explanation is extended in further chapters to develop the fundamental requirements of a microcomputer, by the addition to the microprocessor of different types of memories and input/output circuits.

Throughout, the text is illustrated with good photographs and very well-produced diagrams.

A brief chapter covers the basic types of microcomputer available — single chip, multi-chip, bit-sliced, etc. This is then developed with a discussion that will clearly assist in the initial choice of system, to suit the needs of the reader.

The importance of software development is stressed and program languages are briefly but understandably reviewed. The staffing requirements that will arise, dependent upon the system chosen, are dealt with in a sensible manner.

The four collected experts from various parts of the industry discuss specific software and hardware applications of microprocessor technology. Although these articles are on special cases they do illustrate the ways in which problems can arise during development projects.

The appendices complement the preceding text, giving further information on 'microcomputer options', 'the production of the chip', what types of hardware are available, an introduction to 'Boolean Algebra and logic gates' and finally a useful 'glossary of microcomputer terminology'.

This book can only help the reader to a clearer understanding of what the microcomputer can achieve.

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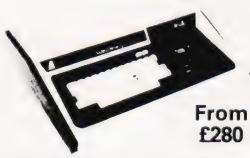

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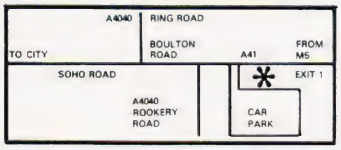

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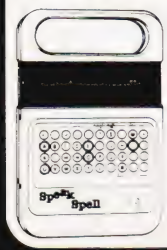

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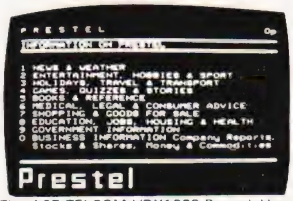

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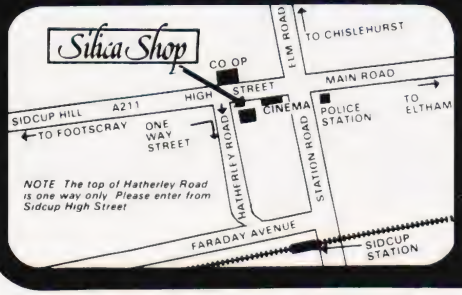

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The August 1980 issue of Computing Today contained a program (of mine) called 'Multipurpose Records'. Each record was limited in length to the width of one screen line, allowing a practical maximum of four columns. It would have been easy to replace this arrangement with a system allowing one screen page per record but the advantage of more space would have meant the loss of column comparison. Running the eye down a column of data can provide valuable secondary information. In order to combine the advantages of both, a fresh approach was needed and this program is the result.

It allows a choice of serial or parallel (column or page) presentation of each record in a file. It was achieved by presenting the KEYFIELD as a stationary item but allowing each column to be revolved into view from the left or right. Once the desired column appears in the window, the file can be sequenced up or down through the various records. Alternatively, a complete record can be displayed in full page detail when required. Although there is no absolute restriction on the number of columns in each record, the file array has ben dimensioned for a maximum of 10 columns in order to keep the memory cost down. While on the subject of memory it would be fair to mention that the program consumes an embarrassing amount of it. As it stands, it will not reside in an 8K PET. However, the screen messages lack the staccato shorthand often found in silicon vocal chords. The REM statements are sprinkled liberally and are equally verbose. It would be easy to get rid of the REMs, cut down on the textual material and slice out the disc-SAVE and disc-LOAD lines if unwanted. Extensive surgery of this kind could eventually slim the program down to 8K capacity although the residual memory would not hold many records.

Before keying in a program of this length, it would be wise to examine the facilities offered and judge whether or not the labour involved would be justified. This information could, of course, be gleaned by study of the listing but in the interests of personal pride the following commercial break may be of interest.

Primary Options

Create File enables a new file to be set up and the column headings and date entered. After each record is completed, the amount of memory left is displayed . . . a necessary warning to deter those of a garrulous nature.

Save File can be used to store on cassette tape or disc with either drive '0' or drive '1' choice. **Load File** is the complementary function.

Search for Record allows any individual record to be accessed by asking for the key field or the record number.

Column Search can be used to examine the entire file and output the key field and record-number of all records which have parameters equal to or within a given range of the search parameter. For example, if the file was on transistor specifications, it is possible to ask for, say, all transistors with a power-max rating less than 600 mW. Similarly, a file on employees may be examined for those under the age of 50 etc.

File Manipulation is a subset of the Primary Options and is examined later.

Exit Program although superficially a trivial option is necessary because the RUN/STOP key is inhibited at the start of the program with POKE 144,49. The program is therefore locked in an endless loop until the Exit Program option is executed and the RUN/STOP is released with POKE 144,46.

File Manipulations

Twelve options are available (if we include the return to **Primary Options** as one of them).

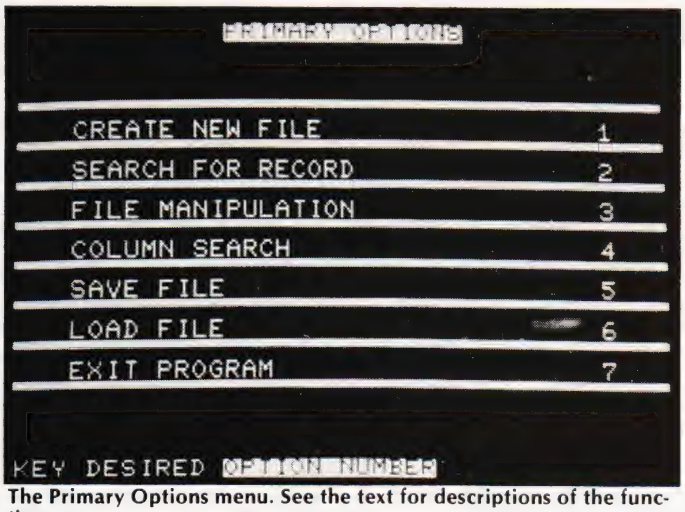
View Columns allows the various columns to be revolved into the window. Key '<' will revolve left and key '>' right.

Next Record slides the next record into view (at least the key-field and the chosen column). **Last Record**, as before but moving backwards.

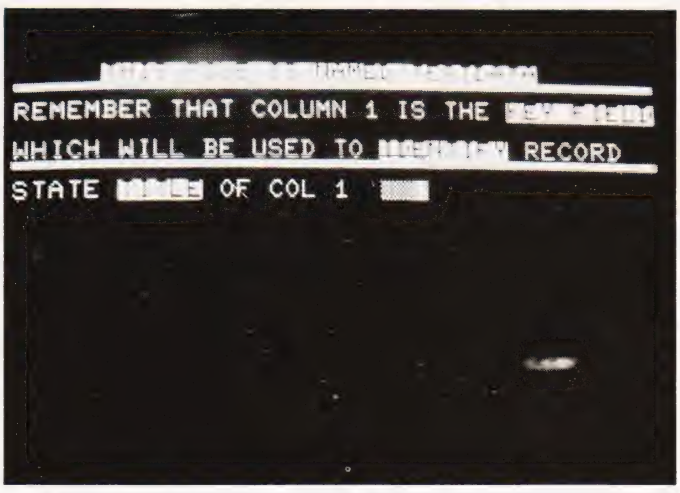
Modify Data allows the data belonging to the column shown to be changed.

Modify Column Heading will not be a frequent requirement but was included (after its original omission) because of criticism from a colleague; apparently he makes frequent mistakes when creating a new file!

Modify Key Field allows changes to the key field. This is the one that doesn't



The Primary Options menu. See the text for descriptions of the functions.



Creating a test file.

move when the columns are rotated.

Change File Name is handy if a file has been loaded from disc and modified in some way.

Add Record allows additional records to be included in the file and the next highest record-number allocated.

View Record displays the complete record with all its columns.

View File is a simple scrolling action of all records. Pressing the 'Space Bar' at any time during the scroll will return control to the window display mode with the particular record captured.

Totalise Column causes the column in the window to be totalised and the average displayed. Naturally the facility is of use only if the data is purely numeric.

Modifications

The program has been tried out by certain colleagues of mine (not normally noted for kindness and tact) who have reluctantly declared it to be 'not bad'... which is indeed high praise from them. The listing shown is aided by a structure chart ('structure' in this sense relating to the normal English without Dijkstra overtones). The switches shown are, of course, intended to represent the software kind, the top one being the ON... GOTO statement in line 330 and the bottom one the set of IF... THEN statements in lines 810 to 930 inclusive. The DIMENSION statement appears three times, lines 180, 2880 and 3330. This was necessary because when loading a file from tape or disc of smaller dimensions than the previously existing file, the residue would have remained. This is prevented by the CLR statement which precedes the DIM. The listing shows the actual dimension statement to be DIM A$(50,10) allowing 50 records, each of 10 columns. This is a purely arbitrary choice and depending on the available memory, can be increased to the limit... but remember to change all three.

Program Portability

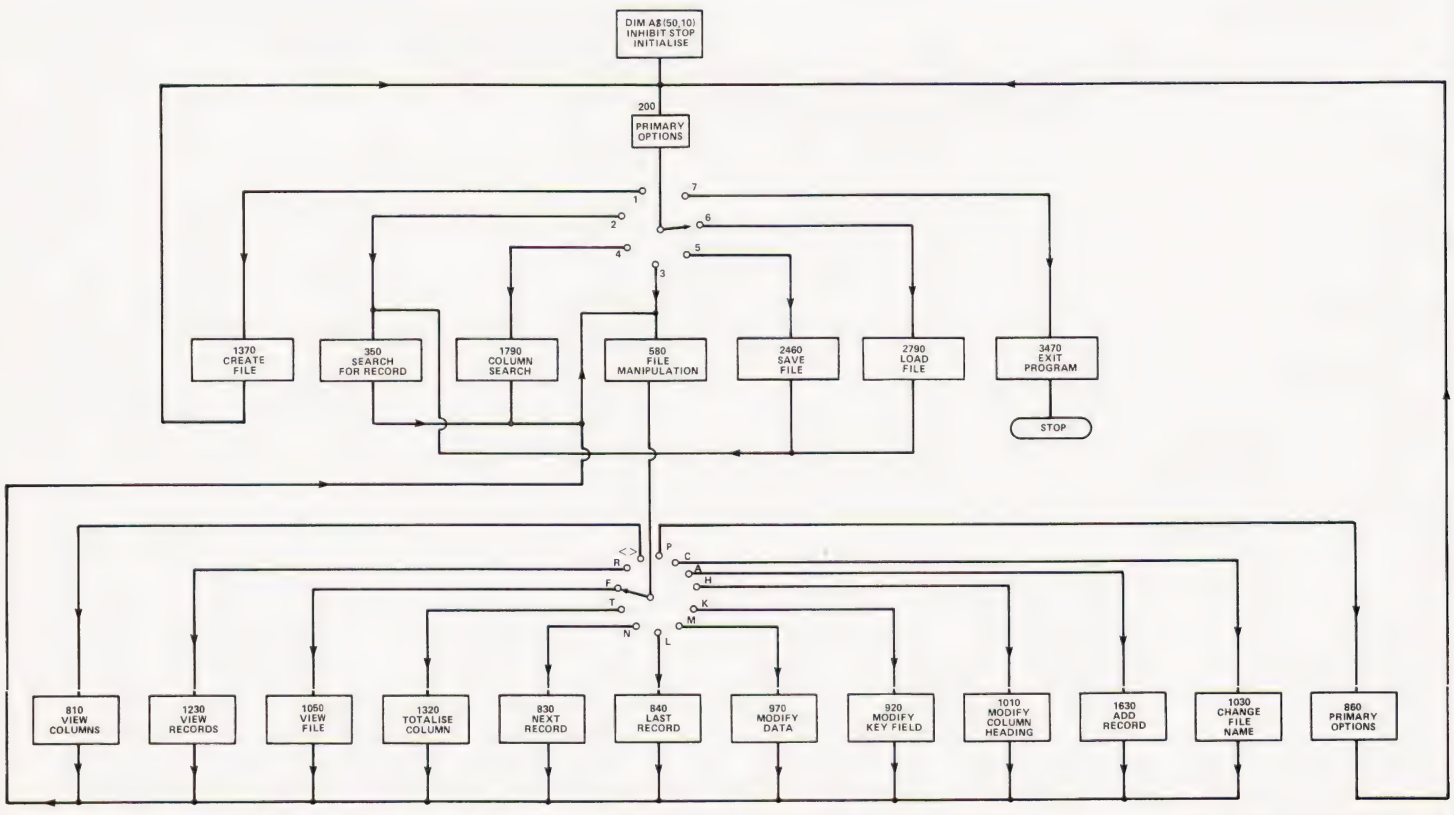
The program was written for the PET series with the New ROM (revision 3). There are only two POKEs which may have to be changed if run on Old ROMs... POKE 158,0 which occurs many times should be changed to POKE 525,0. The other danger is the inibit STOP... POKE 144,49 which is best left out altogether in old ROMs. With regard to using the program on machines other than the PET series, apart from the POKEs, the BASIC is fairly standard and should require only trivial adjustments.

An adjustment may be required in line 190 depending on memory size. For 16K PETs, no change is required. For an 8K system, M=15359 should be changed to M=7167. For a 32K PET, it should be M=31743. This value is used when creating a file to warn how much memory is left after each entry.

The INPUT subroutine at line 2290 to 2340 is peculiar to the Commodore PET and can be replaced by simple INPUT for most other types.

Keying It In

It is always a daunting task to key in a long program such as this. Some people just sit down and keep bashing the keys relentlessly until it is finished... a Herculean task. I would never have the courage for this because there would almost certainly be multiple mistakes. My plan (being a pessimistic, cautious type of person) would be based on the modular system. Enter about 10 or 20 lines at a time, stopping at some logical module-end, and stick in a temporary STOP then RUN the program to that point to see the results. For example, enter lines 100 to 330 inclusive which covers the 'Primary Options' page and put STOP at lines 1370,350,580,1790, 2460,2790 and 3470. When this is RUN and the various options tried out, it is easy to check that the correct linkage from the ON... GOTO statement is established. Then, proceed to enter each primary option part separately and RUN before proceeding with the next one. One final warning — keep on loading each module on to tape (or disc) as each part is proved. In this way the tape will gradually grow and will act as an insurance policy if you do something daft during the current entering session.



The structure diagram of the program showing the links and program line numbers of the various options.

Program Listing

```
100 X=0:REM**NUMBER OF COLUMNS
110 Y=0:REM**NUMBER OF RECORDS
120 R=0:REM**ROW
130 C=0:REM**COLUMN
140 I8$="":REM**KEYBOARD INPUT
150 K$="":REM**GET INPUT
160 F8$="":REM**MESSAGE FLASH
170 N$="":REM**FILE NAME
180 DIM A$(50,10):A$(R,C)="":REM**FILE
185 POKE 144,49,REM**INHIBIT STOP KEY
190 A$(R,C)="":M=15359:F=0:S=0
200 REM**OPTIONS
210 PRINT CHR$(147):PRINT TAB(12)"[REV]PRIMARY OPTIONS[OFF]":
    PRINT:PRINT:PRINT
220 GOSUB 2430
230 PRINT TAB(3)"CREATE NEW FILE"TAB(35)"1":GOSUB 2430
240 PRINT TAB(3)"SEARCH FOR RECORD"TAB(35)"2":GOSUB 2430
250 PRINT TAB(3)"FILE MANIPULATION"TAB(35)"3":GOSUB 2430
260 PRINT TAB(3)"COLUMN SEARCH"TAB(35)"4":GOSUB 2430
270 PRINT TAB(3)"SAVE FILE"TAB(35)"5":GOSUB 2430
280 PRINT TAB(3)"LOAD FILE"TAB(35)"6":GOSUB 2430
290 PRINT TAB(3)"EXIT PROGRAM"TAB(35)"7":GOSUB 2430:
    PRINT:PRINT:PRINT
300 PRINT"KEY DESIRED [REV]OPTION NUMBER[OFF]":POKE 158,0
310 GET K$:IF K$="" THEN 310
320 IF VAL(K$)<1 OR VAL(K$)>7 THEN 310
330 ON VAL(K$) GOTO 1370,350,580,1790,2460,2790,3470
340 REM**SEARCH FOR RECORD
350 PRINT CHR$(147):GOSUB 2430
360 IF Y=0 THEN F8$="[REV]FILE NOT RESIDENT ![OFF]":
    GOSUB 2360:GOTO 210
370 PRINT TAB(11)"[REV]SEARCH PROCEDURES[OFF]":PRINT:PRINT:PRINT:
    GOSUB 2430
380 PRINT:PRINT
390 PRINT"KEY 'K' TO SEARCH BY [REV]KEY FIELD[OFF]":PRINT
400 PRINT"KEY 'N' TO SEARCH BY [REV]RECORD NUMBER[OFF]":PRINT:PRINT
410 GOSUB 2430:POKE 158,0
420 GET K$:IF K$="" THEN 420
430 IF K$="K" THEN 460
440 IF K$="N" THEN 470
450 GOTO 420
460 PRINT TAB(3)"ENTER KEY FIELD":PRINT:PRINT TAB(3);:GOSUB 2300:
    GOTO 510
470 PRINT"[2 SPC]THERE ARE "Y" RECORDS IN THIS FILE":PRINT
480 PRINT TAB(3)"ENTER RECORD NUMBER":PRINT:PRINT TAB(3);:GOSUB 2300
490 R=VAL(I8$):IF R=0 OR R>Y THEN PRINT"[CU]":GOTO 480
500 GOTO 580
510 FOR R=1 TO Y
520 IF I8$=A$(R,1) THEN 580
530 NEXT
540 PRINT CHR$(147):PRINT TAB(240):GOSUB 2430
550 PRINT TAB(10)"[REV]NO SUCH RECORD EXISTS ![OFF]":GOSUB 2430
555 FOR Z=1 TO 1000:NEXT
560 GOTO 350
570 REM**MANIPULATE FILE
580 PRINT CHR$(147):C=2
590 IF Y=0 THEN F8$="[REV]NO FILE EXISTS[OFF]":GOSUB 2360:GOTO 210
600 PRINT"[REV]";N$ TAB(24)"[REV]RECORD NO";R
610 GOSUB 2430
620 PRINT A$(0,1)TAB(20)A$(0,C+CN)
630 GOSUB 2430
640 PRINT"[REV]"A$(R,1);TAB(20)A$(R,C+CN)
650 GOSUB 2430
660 POKE 158,0
670 PRINT"USE '<' AND '>' TO[3 SPC]VIEW COLUMNS"
680 PRINT"KEY 'R' TO[11 SPC]VIEW RECORDS"
690 PRINT"KEY 'F' TO[11 SPC]VIEW FILE":PRINT
700 PRINT"KEY 'T' TO[11 SPC]TOTALISE COLUMN"
710 PRINT"KEY 'N' FOR[10 SPC]NEXT RECORD"
720 PRINT"KEY 'L' FOR[10 SPC]LAST RECORD":PRINT
730 PRINT"KEY 'M' TO[11 SPC]MODIFY DATA"
740 PRINT"KEY 'K' TO[11 SPC]MODIFY KEY FIELD"
750 PRINT"KEY 'H' TO[11 SPC]MODIFY COL.HEADING"
760 PRINT"KEY 'A' TO[11 SPC]ADD RECORD"
770 PRINT"KEY 'C' TO[11 SPC]CHANGE FILE NAME":PRINT
780 PRINT"KEY 'P' FOR[10 SPC][REV]PRIMARY OPTIONS[OFF]"
790 POKE 158,0
800 GET K$:IF K$="" THEN 800
810 IF K$=">" THEN CN=CN+1
820 IF K$="<" THEN CN=CN-1
830 IF K$="N" THEN R=R+1:IF R>Y THEN R=Y:GOTO 580
840 IF K$="L" THEN R=R-1:IF R<1 THEN R=1:GOTO 580
850 IF K$="M" THEN 970
860 IF K$="P" THEN 210
870 IF K$="F" THEN 1050
880 IF K$="R" THEN 1230
890 IF K$="T" THEN 1320
900 IF K$="C" THEN 1030
910 IF K$="H" THEN 1010
920 IF K$="K" THEN CN=0:C=1:GOTO 970
930 IF K$="A" THEN F=1:GOTO 1630
940 IF C+CN<2 OR C+CN>X THEN C=2:CN=0
950 GOTO 580
960 REM**MODIFY RECORD
970 GOSUB 2430
980 PRINT"ENTER CORRECT DATA FOR [REV]"A$(0,C+CN):GOSUB 2300:
    A$(R,C+CN)=I8$
990 C=2
1000 GOTO 580
1010 GOSUB 2430
1020 PRINT"ENTER CORRECT COLUMN HEADING ":GOSUB 2300:A$(0,C+CN)=I8$:
     GOTO 580
1030 GOSUB 2430:PRINT"ENTER NEW FILE NAME ":GOSUB 2300:N$=I8$:
     GOTO 580
1040 REM**VIEW FILE
1050 PRINT CHR$(147):GOSUB 2430
1060 PRINT TAB(9)"FILE WILL SCROLL DOWN":PRINT:PRINT
1070 PRINT TAB(4)"TO STOP SCROLLING,PRESS [REV]SPACE BAR[OFF]"
1080 GOSUB 2430:REM**LINE
1090 FOR Z=1 TO 2000:NEXT
1100 PRINT CHR$(147):PRINT TAB(12)"[REV]";N$"[OFF]":PRINT
1110 GOSUB 2430
1120 FOR R=1 TO Y
1130 FOR C=1 TO X
1140 PRINT A$(0,C)TAB(20)A$(R,C)
1150 IF C=1 THEN PRINT"[40©d]"
1160 FOR Z=1 TO 400:NEXT
1170 NEXT:GOSUB 2430
1180 GET K$:IF K$="[SPC]" THEN 580
1190 NEXT
1200 FOR Z=1 TO 600:NEXT
1210 R=Y:GOTO 580
1220 REM**VIEW RECORD
1230 PRINT CHR$(147):PRINT"[REV]";N$ TAB(19)"RECORD NO ";R:
     GOSUB 2430
1240 PRINT TAB(15)A$(R,1):GOSUB 2430
1250 FOR C=2 TO X
1260 PRINT A$(0,C)TAB(19)A$(R,C):GOSUB 2430
1270 NEXT
1280 PRINT TAB(5)"[REV]PRESS SPACE BAR TO RETURN[OFF]":POKE 158,0
1290 GET K$:IF K$<>"[SPC]" THEN 1290
1300 GOTO 580
1310 REM**TOTALS
1320 PRINT CHR$(147):GOSUB 2430:T=0:PRINT
1330 FOR R=1 TO Y:T=T+VAL(A$(R,C+CN)):NEXT
1340 PRINT"[REV]"A$(0,C+CN)"[OFF]COLUMN TOTAL IS"TAB(30);T:PRINT
1350 PRINT"AND THE AVERAGE IS"TAB(30)T/Y:GOSUB 2430:PRINT:
     PRINT:GOTO 1280
1360 REM**CREATE NEW FILE
1370 PRINT CHR$(147):F8$="WARNING.ARE YOU SURE ?":GOSUB 2360
1380 PRINT TAB(129)"ANSWER Y(YES) OR N(NO)":POKE 158,0
1390 GET K$:IF K$="" THEN 1390
1400 IF K$="N" THEN 210
1410 IF K$="Y" THEN 1430
1420 GOTO 1390
1430 PRINT CHR$(147):CLR:DIM A$(50,10)
1440 PRINT TAB(12)"[REV]CREATE RECORD[OFF]":PRINT
1450 GOSUB 2430:REM**LINE
1460 PRINT"WHAT IS FILE NAME [2©&][SPC]";:GOSUB 2300:
     REM**KEYBOARD INPUT
1470 N$=I8$:PRINT
1480 GOSUB 2430:REM**LINE
1490 PRINT"HOW MANY COLUMNS IN EACH RECORD [2©&][SPC]";:GOSUB 2300
1500 X=VAL(I8$):PRINT
1510 IF X<1 OR X>10 THEN PRINT"[REV]MAXIMUM IS 10[OFF]":GOTO 1490
1520 PRINT CHR$(147):C=1
1530 PRINT"[REV]THIS FILE IS NAMED ";N$:GOSUB 2430
1540 PRINT"REMEMBER THAT COLUMN 1 IS THE [REV]KEY FIELD[OFF]":PRINT
1550 PRINT"WHICH WILL BE USED TO [REV]IDENTIFY[OFF] RECORDS":
     GOSUB 2430
1560 PRINT"STATE [REV]TITLE[OFF] OF COL"C" [2©&]";
1570 GOSUB 2300:REM**KEYBOARD INPUT
1580 A$(0,C)=I8$:PRINT
1590 GOSUB 2430:REM**LINE
1600 IF C=X THEN 1630
1610 C=C+1:GOTO 1560
1620 REM**ENTER FILE DATA
1630 IF F=1 THEN R=Y+1:Y=Y+1:GOTO 1650:REM**ADD RECORD
1640 R=1:Y=1:REM**ENTER DATA
1650 PRINT CHR$(147):PRINT TAB(12)"[REV]RECORD NUMBER";
     R"[OFF]" GOSUB 2430
1660 PRINT:PRINT"YOU HAVE "FRE(0)" BYTES LEFT IN MEMORY
1670 GOSUB 2430:PRINT
1680 PRINT TAB(3)"ENTER 'END' IN EACH COLUMN TO":PRINT
1690 PRINT TAB(9)"TERMINATE FILE":GOSUB 2430
1700 FOR C=1 TO X
1710 PRINT"ENTER "A$(0,C)TAB(18);:GOSUB 2300
1720 A$(R,C)=I8$:PRINT
1730 GOSUB 2430
1740 NEXT
```

MULTICOLUMN RECORDS

```
1750 IF F=1 THEN F=0:GOTO 580
1760 IF I8$="END" THEN R=1:Y=Y-1:GOTO 210
1770 R=R+1:Y=Y+1:GOTO 1650
1780 REM**COLUMN SEARCH
1790 PRINT CHR$(147):PRINT TAB(240):GOSUB 2430:E=0
1800 FOR R=1 TO Y
1810 PRINT"NAME [REV]COLUMN[OFF] OF INTEREST ";:GOSUB 2300
1815 CI$=I8$:PRINT:GOSUB 2430
1820 C=1
1830 IF A$(0,C)=CI$ THEN 1860
1840 C=C+1:IF C<X+1 THEN 1830
1850 PRINT CHR$(147):F8$="NO SUCH COLUMN":GOSUB 2360:GOTO 210
1860 PRINT"ENTER "CI$" OF INTEREST ";:GOSUB 2300:DI$=I8$:PRINT:
     GOSUB 2430
1870 PRINT:PRINT:GOSUB 2430:REM**LINE
1880 IF VAL(LEFT$(DI$,1))=0 THEN 2170
1890 PRINT"DO YOU WANT ALL "CI$ " :-":PRINT
1900 PRINT TAB(2)"EQUAL TO"TAB(20)DI$ TAB(28)"KEY 'E'":PRINT
1910 PRINT TAB(2)"LESS THAN"TAB(20)DI$ TAB(28)"KEY 'L'":PRINT
1920 PRINT TAB(2)"GREATER THAN"TAB(20)DI$ TAB(28)"KEY 'G'"
1930 POKE 158,0
1940 GET K$:IF K$="" THEN 1940
1950 IF K$="E" THEN 2170
1960 IF K$="L" THEN 1990
1970 IF K$="G" THEN 2080
1980 GOTO 1940
1990 PRINT CHR$(147):GOSUB 2430:S=0
2000 PRINT TAB(6)"FOLLOWING "N$" HAVE ":PRINT
2010 PRINT TAB(8)CI$" LESS THAN "DI$:GOSUB 2430:PRINT
2020 FOR R=1 TO Y
2030 IF VAL(A$(R,C))<VAL(DI$) THEN PRINT TAB(10)A$(R,1)TAB(22)
     "RECORD NO ";R
2040 S=1
2050 NEXT
2060 IF S=0 THEN PRINT CHR$(147):GOTO 2240
2070 GOTO 2250
2080 PRINT CHR$(147):GOSUB 2430:S=0
2090 PRINT TAB(6)"FOLLOWING "N$" HAVE ":PRINT
2100 PRINT TAB(8)CI$" GREATER THAN "DI$:GOSUB 2430:PRINT
2110 FOR R=1 TO Y
2120 IF VAL(A$(R,C))>VAL(DI$) THEN PRINT TAB(10)A$(R,1)TAB(22)
     "RECORD NO ";R
2130 S=1
2140 NEXT
2150 IF S=0 THEN PRINT CHR$(147):GOTO 2240
2160 GOTO 2250
2170 PRINT CHR$(147):GOSUB 2430:S=0
2180 PRINT TAB(6)"FOLLOWING "N$" HAVE ":PRINT
2190 PRINT TAB(8)CI$" = "DI$:GOSUB 2430:PRINT
2200 FOR R=1 TO Y
2210 IF A$(R,C)=DI$ THEN PRINT TAB(10)A$(R,1)TAB(22)"RECORD NO ";R
2215 S=1
2220 NEXT
2230 IF S=1 THEN 2250
2240 F8$="[REV]NO DATA EXISTING[OFF]":GOSUB 2360:GOTO 580
2250 PRINT:POKE 158,0:PRINT TAB(10)"[REV]PRESS SPACE BAR[OFF]"
2260 GET K$:IF K$="" THEN 2260
2270 IF K$="[OFF]" THEN R=R-1:GOTO 580
2280 GOTO 2260
2290 REM**CRASH-PROOF INPUT TO I8$
2300 OPEN 1,0
2310 INPUT#1,I8$
2320 IF I8$="" THEN 2310
2330 CLOSE 1
2340 RETURN
2350 REM**FLASH F8$
2360 FOR Z=1 TO 6
2370 PRINT TAB(10)F8$
2380 FOR T8=1 TO 250:NEXT
2390 PRINT CHR$(147):FOR T8=1 TO 100:NEXT
2400 NEXT
2410 RETURN
2420 REM**PRINT LINE
2430 PRINT"[40©#]":RETURN
2440 RETURN
2450 REM**SAVE FILE
2460 PRINT CHR$(147):IF Y=0 THEN F8$="[REV]NO FILE EXISTS[OFF]"
2465 GOSUB 2360:GOTO 210
2470 PRINT TAB(240):GOSUB 2430:PRINT
2480 PRINT TAB(3)"ARE YOU SAVING ON [REV]DISC[OFF]
     OR [REV]TAPE[OFF]?":PRINT
2490 GOSUB 2430:PRINT:PRINT:PRINT
2500 PRINT TAB(11)"KEY 'D' OR 'T'":POKE 158,0
2510 GET K$:IF K$="" THEN 2510
2520 IF K$="T" THEN 2560
2530 IF K$="D" THEN 3140
2540 GOTO 2510
2550 REM**SAVE FILE ON TAPE
2560 PRINT CHR$(147):PRINT TAB(240)
2570 PRINT TAB(120)
2580 PRINT"HAVE YOU INSERTED A CASSETTE?":PRINT
2590 PRINT"HAVE YOU REWOUND IT TO DESIRED POSITION":PRINT
2600 PRINT"HAVE YOU SWITCHED MOTOR OFF?":PRINT:PRINT
2610 PRINT"[REV]YOU MUST NOW ANSWER Y(YES)[OFF]"
2620 POKE 158,0
2630 GET K$:IF K$<>"Y" THEN 2630
2640 PRINT CHR$(147):PRINT TAB(240):GOSUB 2430
2650 PRINT TAB(12)"[REV]BE PATIENT ![OFF]":GOSUB 2430:PRINT:PRINT
2660 PRINT TAB(5)"YOUR FILE [REV]";N$"[OFF]":PRINT
2670 PRINT TAB(5)"WILL TAKE TIME TO SAVE ON TAPE":PRINT:PRINT
2680 OPEN 1,1,1,N$
2690 PRINT#1,Y:PRINT#1,X
2700 FOR R=1 TO Y
2710 FOR C=1 TO X:PRINT#1,A$(R,C):NEXT
2720 NEXT
2730 FOR C=1 TO X:PRINT#1,A$(0,C):NEXT
2740 CLOSE 1
2750 GOSUB 2430
2760 PRINT"FILE NAMED [REV]";N$"[OFF]NOW ON TAPE":GOSUB 2420
2765 FOR Z=1 TO 1000:NEXT
2770 GOTO 210
2780 REM**LOAD FILE
2790 PRINT CHR$(147):PRINT TAB(240)
2800 GOSUB 2430
2810 PRINT TAB(2)"ARE YOU LOADING FROM TAPE OR DISC ?":GOSUB 2430:
     PRINT:PRINT
2820 PRINT TAB(5)"KEY 'T' OR 'D'":POKE 158,0
2830 GET K$:IFK$="" THEN 2830
2840 IF K$="T" THEN 2880
2850 IF K$="D" THEN 3330
2860 GOTO 2830
2870 REM**LOAD FROM TAPE
2880 PRINT CHR$(147):PRINT TAB(240):CLR:DIM A$(50,10)
2890 PRINT"ENTER FILE NAME";TAB(20);:GOSUB 2300:N$=I8$
2900 PRINT
2910 PRINT TAB(240)
2920 PRINT"IS THIS FILE IN CASSETTE?":PRINT
2930 PRINT"IS IT REWOUND?":PRINT
2940 PRINT"IS THE MOTOR SWITCHED OFF?":PRINT:PRINT:PRINT
2950 PRINT"IF SO,ANSWER Y(YES)"
2960 POKE 158,0
2970 GET K$:IF K$="" THEN 2970
2980 IF K$<>"Y" THEN 2970
2990 PRINT CHR$(147):PRINT TAB(240)
3000 GOSUB 2430
3010 PRINT TAB(3)"HAVE PATIENCE ! THIS TAKES TIME":GOSUB 2430:PRINT
3020 OPEN1,1,0,N$
3030 INPUT#1,Y :INPUT#1,X
3040 FOR R=1 TO Y
3050 FOR C=1 TO X
3060 INPUT#1,A$(R,C)
3070 NEXT:NEXT
3080 FOR C=1 TO X
3090 INPUT#1,A$(0,C)
3100 NEXT
3110 CLOSE1
3120 POKE 144,49:GOTO 350
3130 REM**SAVE FILE ON DISC
3140 PRINT CHR$(147):PRINT TAB(240)
3150 GOSUB 2430
3160 PRINT TAB(2)"DO YOU WANT TO SAVE ON [REV]DRIVE '0'[OFF]":PRINT
3170 PRINT TAB(2)"OR ON [REV]DRIVE '1'[OFF]?":GOSUB 2430:
     PRINT:PRINT:PRINT
3180 GET K$:IF K$="" THEN 3180
3190 IF K$="0" THEN DR=0:GOTO 3220
3200 IF K$="1" THEN DR=1:GOTO 3220
3210 GOTO 3180
3220 N1$="DR:":N2$=",SEQ,WRITE":NN$=N1$+N$+N2$
3230 OPEN1,8,4,NN$
3240 PRINT#1,Y;CHR$(13);
3250 PRINT#1,X;CHR$(13);
3260 FOR R=1 TO Y
3270 FOR C=1 TO X:PRINT#1,A$(R,C);CHR$(13);:NEXT
3280 NEXT
3290 FOR C=1 TO X:PRINT#1,A$(0,C);CHR$(13);:NEXT
3300 CLOSE1
3310 GOTO 210
3320 REM**LOAD FILE FROM DISC
3330 PRINT CHR$(147):PRINT TAB(240):CLR:DIM A$(50,10)
3340 PRINT"ENTER [REV]NAME[OFF] OF FILE":PRINT:PRINT:
     PRINT:PRINT TAB(7)
3350 GOSUB 2300:N$=I8$:NN$=N$
3360 N1$="0:":N2$=",SEQ,READ":NN$=N1$+NN$+N2$
3370 OPEN1,8,4,NN$
3380 INPUT#1,Y:INPUT#1,X
3390 FOR R=1 TO Y
3400 FOR C=1 TO X
3405 INPUT#1,A$(R,C)
3410 NEXT:NEXT
3420 FOR C=1 TO X
3430 INPUT#1,A$(0,C)
3440 NEXT
3450 CLOSE1
3460 GOTO 350
3470 PRINT CHR$(147):REM**EXIT
3480 F8$="[REV]E X I T   APSFILE":GOSUB 2360
3490 POKE 144,46:END
```

Please note that this program has been prepared from a running listing on a daisy wheel printer. The '↑' symbol appears throughout as '©' in graphics statements.

A NASCOM-2 BASED SYSTEM FOR £1499 + VAT

The proven Nascom-2 microcomputer can now be bought as a complete system from £1499 + VAT. For this price you get the Nascom-2 kit, 16K RAM board kit, Kenilworth case with 2 card frame, Centronics 737 printer, 10 inch monitor, and the Gemini Dual Drive Floppy Disk System. The CPU and RAM boards are also available built – the additional cost is available on application.

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Nascom-2 Single drive system . . . **£450 + VAT**
Nascom-2 Double drive system . . **£640 + VAT**
Nascom-1 Single drive system . . **£460 + VAT**
Nascom-1 Double drive system . . **£640 + VAT**
Additional FD250 drives . . . . . **£205 + VAT**

D-DOS SYSTEM. The disk unit is also available without CP/M to enable existing Nas-Sys software to be used. Simple read, write routines are supplied in EPROM. The unit plugs straight into the Nascom PIO.

Single drive system . . . . . **£395 + VAT**
(please state which Nascom the unit is for)

Certain parts of the CP/M and D-DOS disk systems are available in kit form.
Details available on request.

KENILWORTH CASE FOR NASCOM-2

The Kenilworth case is a professional case designed specifically for the Nascom-2 and up to four additional 8" x 8" cards. It has hardwood side panels and a plastic coated steel base and cover. A fully cut back panel will accept a fan, UHF and video connectors and up to 8 D-type connectors. The basic case accepts the N2 board, PSU and keyboard. Optional support kits are available for 2 and 5 card expansion.

Kenilworth case . . . . . **£49.50 + VAT**
2-card support kit . . . . . **£7.50 + VAT**
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NASBUS EPROM BOARD

The Nasbus compatible EPROM board accepts up to 16,2716 or 16,2708 EPROMs. It has a separate socket for the MK36271 8K BASIC ROM for the benefit of Nascom-1 users. And for Nascom-2 users, a wait state for slower EPROMs. The board also supports the Nascom Page Mode Scheme.

EPROM Board (kit) . . . . . **£55 + VAT**
EPROM Board (built & tested) . . . **£70 + VAT**

CASSETTE ENHANCING UNIT

The Castle interface is a built and tested add-on unit which lifts the Nascom-2 into the class of the fully professional computer. It mutes spurious output from cassette recorder switching, adds motor control facilities, automatically switches output between cassette and printer, simplifies 2400 baud cassette operating and provides true RS232 handshake.

Castle Interface Unit . . . . . **£17.50 + VAT**

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For really interesting and useful interactions with the 'outside world' the Milham analogue to digital converter is a must. This 8-bit converter is multiplexed between four channels – all software selectable. Sampling rate is 4KHz. Sensitivity is adjustable. Typical applications include temperature measurement, voice analysis, joystick tracking and voltage measurement. It is supplied built and tested with extensive software and easy connection to the Nascom PIO.

Milham A-D Converter
(built and tested) . . . . . **£49.50 + VAT**

PROGRAMMER'S AID

For Nascom ROM BASIC running under Nas-Sys. Supplied in 2 x 2708 EPROMs. Features include: auto line numbering; intelligent renumbering; program appending; line deletion; hexadecimal conversion; recompression of reserved words; auto repeat; and printer handshake routines. When ordering please state whether this is to be used with Nas-Sys 1 or 2. **Price £28 + VAT.**

DUAL MONITOR BOARD

A piggy-back board that allows N1 users to switch rapidly between two separate operating systems. **Price (kit) £6.50 + VAT.**

NASCOM-2 Microcomputer Kit . **£225 + VAT**
NASCOM-1 Microcomputer Kit . **£125 + VAT**
Built & tested . . **£140 + VAT**

CENTRONICS 737 MICRO PRINTER

A high performance, low price, dot-matrix printer that runs at 80cps (proportional) and 50cps (monospaced). This new printer gives text processing quality print. And can print subscripts and superscripts. It has 3-way paper handling and parallel interface as standard. Serial interface is optional. **Price £425 + VAT.** Fanfold paper (2000 series) **£18 + VAT.**

GEMINI 'SUPERMUM'

12 x 8 piggy-back board for Nascom-1 offering five-slot motherboard, quality 5A power supply and reliable buffering with reset jump facility. **Price £85 + VAT.**

BITS & PC's PCG

5 x 4 board which plugs straight into Nascom-2. Operates on cell structure of 128 dots, producing 64 different cells. Once defined, each cell may be placed anywhere, any number of times on screen simultaneously. Max screen capacity: 768 cells. Dot resolution: 384 x 256 = 98304. Many other features including intermixing of alpha-numeric characters and pixels. **Price (kit) £60 + VAT.**

GEMINI 64K RAM BOARD

Newly developed NASBUS board that can accommodate up to 64K of RAM with optional Page Mode facility. **Prices: £90 (16K), £110 (32K), £130 (48K), £150 (64K). Add VAT to all prices.**

DISC CONTROLLER CARD KIT

Henelec kit for up to three 5¼ inch drives. **Price £75.00 + VAT.**

DISKPEN

The powerful text editor written for the Nascom is now available on a 5¼ inch floppy disk with a number of new features. **Price £43.25 + VAT.**

PORT PROBE

Allows monitoring of input and output of Nascom P10. This board can generate interrupts and simulate handshake control. **Price (kit) £17.50 + VAT.**

HEX & CONTROL KEYPADS

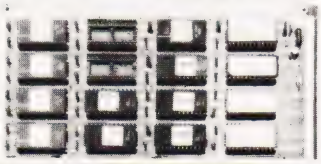
Hexadecimal scratchpad keyboard kit for N1/2: **Price £34 + VAT.**
As above but including (on the same board) a control keypad kit to add N2 control keys to N1. **Price £40.50 + VAT.**

BASIC PROGRAMMER'S KIT

Supplied on tape for N1/2 running Nas-Sys and Nascom ROM BASIC. Features include auto line number, full cross-reference listing, delete lines, find, compacting command, plus a comprehensive line re-numbering facility. **Price £13 + VAT.**

PROM-PROG

2708 (multi-rail) and 2716 (single-rail) EPROM programmer kit controlled by N1/2 PIO. Supplied with comprehensive software for use with Nas-Sys. . ice **£26.95 + VAT.**



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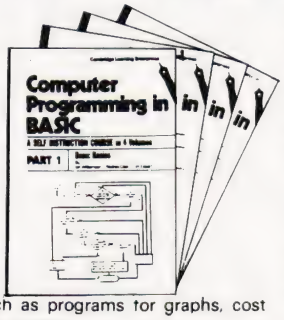

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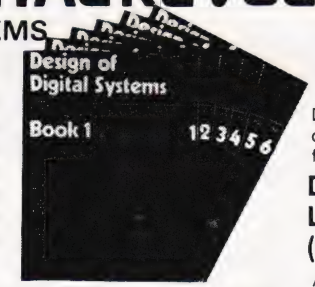

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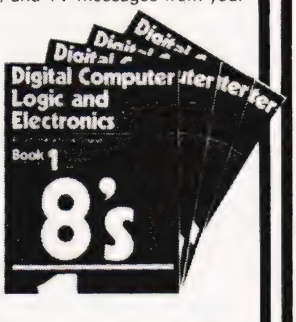

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MEDIA GUIDE

We list the major suppliers of such necessities as floppy discs, paper, printer ribbons and other vital media for your micro.

Microcomputers used for business applications, software development or just for handling personal information all have one thing in common — they need media. Computer media can be loosely defined as the other bits needed to make the systems go: ribbons and paper for the printer, floppy discs or cassettes for program and data storage, flowcharting stencils for the programmer, etc.

A number of companies exist to support the requirements of mainframe computer users and they generally supply everything including the computer equivalent of the kitchen sink! Over the last few years, however, many of these established companies, together with several new ones, have realised that the micro offers a new market and are stocking up with new ranges to satisfy the demand.

Using The Guide

Finding out who stocks a given type of product could hardly be easier. All you have to do is to locate the category — **Labels**, for example — then find the item that you want — Single Sheets perhaps — and run your finger down the column until you come across a 'blob'. Looking to either the left or right will give you the name of the company stocking this product (there may be several). The full address and telephone number of the company is given on the back page of this supplement.

In the address listing some of the companies are marked with an asterisk, which indicates that they supply a catalogue. It is well worth getting hold of a couple of these, especially if you are in the business market or use a lot of media, because some of them offer further discounts for quantities. The catalogues also list items that we haven't included in the guide: bursters, collaters, shredders, and so on.

Inclusions And Omissions

The guide cannot, simply because of space, list every single product and type thereof. What it does is to give a single heading for all product types. For example, floppy discs are not further sub-divided into 5¼" or 8" types. Check the suppliers' advertisements or catalogue for detailed information.

There are one or two points well worth checking *before* you order some types of media. The printers used with micros often have a narrower cartridge than usual: 9½" is typical. Make sure that you double check the width of your printer before ordering stationery. The other vital point is to check that your printer can handle multi-part forms. They are very useful in the business field, but can ruin a matrix head if it is not designed to take the load.

Acknowledgements

Our thanks are extended to those companies which took the time and trouble to send in information, sometimes more than we really know what to do with! Brickbats can be shared equally among the dozen or so companies who couldn't be bothered to reply to letters and phone calls.

Any inaccuracies are probably the direct result of severe eyestrain and should not be taken personally. The compiler would be grateful to hear about them, however.

COMPANY	PAPER					LABELS		MAGNETIC						
	LISTING	PRE–PRINTED	CARRIER	MULTI–PART	DESIGN	CONTINUOUS	SINGLES	CASSETTES	DATA CARTRIDGES	TAPE REELS	FLOPPY DISCS	CARTRIDGE DISCS	PRINTOUT BINDERS	
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BASF										✓	✓	✓		
BFI								✓	✓		✓			
CARE	✓	✓						✓	✓	✓	✓	✓	✓	
DATA EFFICIENCY	✓					✓		✓	✓	✓	✓	✓	✓	
DISKING											✓			
ELDON OFFICE													✓	
FLEXIFORM														
HAL		✓		✓	✓						✓			
A W HAWKINS	✓										✓			
IEM														
INMAC	✓									✓	✓	✓	✓	
KORES NORDIC											✓			
LUCAS														
MBF		✓	✓		✓	✓								
MEMOREX								✓	✓	✓	✓	✓		
MOORE PARAGON		✓		✓	✓									
OFREX	✓					✓							✓	
PCA	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	
PFC	✓			✓										
REXEL														
DAVID RICHARDS	✓	✓												
3M								✓	✓	✓	✓	✓		
TR	✓					✓					✓			
TSE											✓			
WILKES	✓	✓		✓	✓	✓		✓		✓	✓		✓	
WILLIS	✓					✓		✓	✓	✓	✓	✓	✓	
ZYGAL														

MEDIA GUIDE

	STORAGE						FURNITURE			MISCELLANEOUS				
COMPANY	PRINTOUT TRAYS	CASSETTE STORAGE	TAPE RACKS	DISC RACKS	FLOPPY BOXES	FLOPPY FILES	DESKS ETC	VDU TURNTABLE	FIREPROOF CABINETS	PROGRAMMING AIDS	DISC CLEANERS	RIBBONS	PRINTWHEELS
AVERY LABELS													
BASF													
BFI					✓	✓					✓		
CARE							✓		✓			✓	
DATA EFFICIENCY	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DISKING					✓	✓					✓		
ELDON OFFICE	✓												
FLEXIFORM			✓	✓									
HAL												✓	✓
A W HAWKINS												✓	✓
IEM		✓			✓	✓		✓					
INMAC	✓		✓	✓	✓	✓	✓	✓		✓		✓	✓
KORES NORDIC												✓	✓
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MBF									✓				
MEMOREX													
MOORE PARAGON													
OFREX	✓	✓	✓	✓	✓	✓	✓			✓		✓	✓
PCA		✓	✓	✓	✓	✓	✓	✓	✓				
PFC												✓	
REXEL						✓							
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3M					✓	✓							
TR													
TSE												✓	✓
WILKES											✓	✓	
WILLIS	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓
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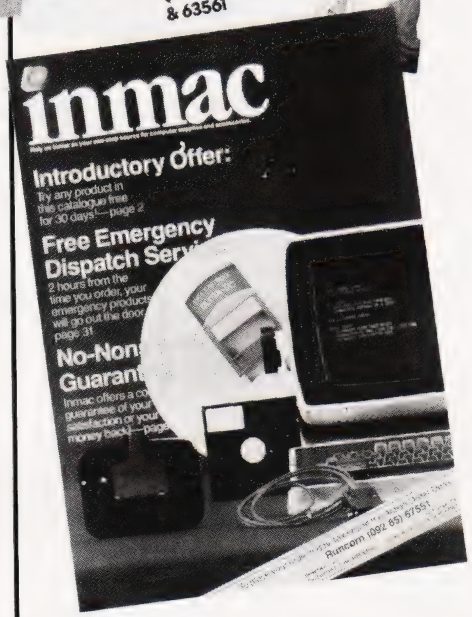

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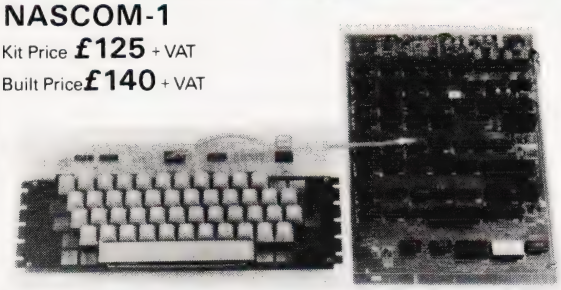

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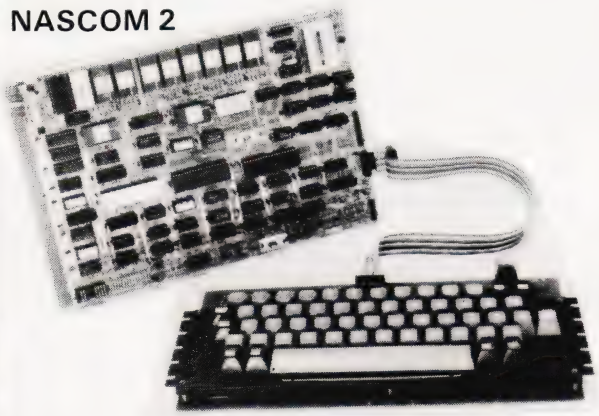

Kit includes all parts to build CPU board which has resident 8K microsoft BASIC and 2K NAS-SYS 1 monitor for machine code programming. Included with kit is a fully assembled LICON QWERTY SOLID STATE KEYBOARD specially designed to exploit the potential of the NAS-SYS monitor. Other interfaces include video to monitor or domestic TV, Kansas City standard cassette interface (300/1200 baud) or RS232/20mA teletype interface.
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System uses Z80A which gives selectability between 2 or 4 MHz

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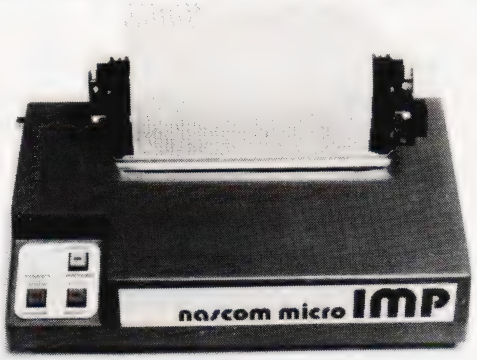

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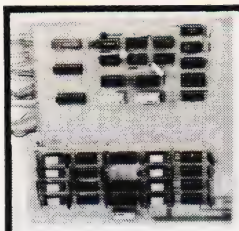

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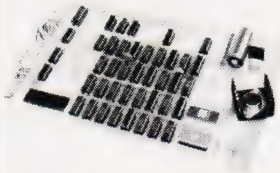

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More great deals from 6 Nascom Dealers

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This Nasbus compatible EPROM board accepts up to 16,2716 or 2708 EPROMs it has a separate socket for the MK36271 8K BASIC ROM for the benefit of Nascom-1 users. And for Nascom-2 users, a wait state for slower EPROMs. The board also supports the Nascom Page Mode Scheme.

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The Castle interface is a built and tested add-on unit which lifts the Nascom-2 into the class of the fully professional computer. It mutes spurious output from cassette recorder switching, adds motor control facilities, automatically switches output between cassette and printer, simplifies 2400 baud cassette operating and provides true RS232 handshake.

Castle Interface Unit ..... **£17.50 + VAT**

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For really interesting and useful interactions with the 'outside world' the Milham analogue to digital converter is a must. This 8-bit converter is multiplexed between four channels – all software selectable. Sampling rate is 4KHz. Sensitivity is adjustable. Typical applications include temperature measurement, voice analysis, joystick tracking and voltage measurement. It is supplied built and tested with extensive software and easy connection to the Nascom PIO. Milham A-D Converter (built and tested).... **£49.50 + VAT**

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5 x 4 board which plugs straight into Nascom-2. Operates on cell structure of 128 dots, producing 64 different cells. Once defined, each cell may be placed anywhere, any number of times on screen simultaneously. Max screen capacity: 768 cells. Dot resolution: 384 x 256 = 98304. Many other features including intermixing of alpha-numeric characters and pixels. **Price (kit) £60 + VAT.**

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Newly developed Nasbus compatible board that can accommodate up to 64K of RAM including Page Mode facility. **Kit Prices: £110 (16K), £130 (32K), £150 (48K), £170 (64K). Add VAT to all prices.**

All prices are correct at time of going to press and are effective 1st June 1981.

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The powerful text editor written for the Nascom is now available on a 5¼ inch floppy disk with a number of new features. **Price £43.25 + VAT.**

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Allows monitoring of input and output of Nascom PIO. This board can generate interrupts and simulate handshake control. **Price (kit) £17.50 + VAT.**

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Simon N Goodwin

A tactical thermonuclear wargame that you can fight out in your living room. Written for the Video Genie it is fully documented for conversion to other systems.

Holocaust' is a jolly game giving you a chance to press the red button and start a nuclear war! If that seems rather morbid, think that at least when your computer is in charge nobody gets hurt. . .

The program puts you in control of an arsenal of atomic bombs, featuring old-fashioned 'A' bombs, bigger and better 'H' bombs and everyone's favourite, the 'N' or neutron bomb, which kills everything but doesn't damage the valuable factories that you will need when the war is over (to build some more missiles).

Game Scenario

You are faced with an invasion from the East. As the attacking tanks come rolling over the horizon your radar scanners help you to target on them and protect your cities from capture. This is not one of the common games where you have to enter the Cartesian co-ordinates that you want to shoot at. In this game, your radar sights scan back and forth horizontally and vertically across the display, you select your favourite bomb when they are pointing in the right direction and the missile comes whistling down onto the chosen target — you hope!

Of course it is all too easy to make a slight miscalculation and blow up one of your favourite cities instead of an enemy infantry division. There again, if you'd used an 'H' bomb you would probably have zapped two or three cities as well as the enemy unit you were aiming at.

Playing The Game

The aim of the game is to blow up each of the 12 attacking units before they are able to cross the display. They are continually moving in a semi-random manner, generally from east to west across the screen. Your success is measured in terms of your Devastation Rating — the 'score' printed on the left-hand edge of the screen. The lower this rating at the end of the game, the better. It *increases* whenever you fire a bomb, especially if it lands on one of your cities. The more damage your missile does, the greater its effect on your score. Your rating *falls* when you manage to hit one of the enemy units.

A continuous display of the number of missiles of each kind remaining is maintained on the left-hand side of the screen as the battle takes place. The explosion of the bombs is marked by a flashing haze on the screen. This will destroy any enemy troops or friendly cities caught beneath it, and varies in size according to the type of bomb that has been launched. 'H' bombs and 'A' bombs leave an area of permanent damage (the footprint) after they have exploded — if an enemy unit moves into one of these areas it is killed by radiation poisoning.

At the start of the game you are asked to enter your skill rating. This governs the number of missiles you have at the start of play — remember that the invaders will win automatically if you run out of missiles before they have all been destroyed. If you press any key other than 0-9 the machine will ignore you and wait for you to specify a valid rating. When you have done so the screen is cleared and split into two areas — a column on the left for information such as score and ammunition supplies, and a larger square area upon which the battle will take place.

The 12 arrow heads on the right of the display are the attacking forces — as soon as the screen has been fully set up they will begin to move. The 14 random asterisk '*' symbols represent your cities and industries. Two small cursors will flash along the side and top of the screen — these are your radar scanners. As they move you can stop them by pressing either 'A', 'H' or 'N'. As soon as both vertical and horizontal target lines have been set the missile will be launched to the appropriate point on the screen — 'H' will launch an 'H' bomb and so forth. There is no need to press NEW LINE or ENTER when launching missiles. If you try to fire a type of missile that you have run out of, a message will appear at the bottom left of the screen and the invaders will take advantage of the chance to move unmolested.

Scoring

Rating +15 : Neutron bomb dropped
Rating +50 : Hydrogen bomb dropped
Rating +20 : Atom bomb dropped
Rating −30 : Enemy unit destroyed
Rating +100 : For each city blasted
Rating +40 : For each city captured

The Program

The listing may seem quite short in relation to the description of the program's facilities. This is for two main reasons — first, the requirement that it should run fairly quickly. The more variables or lines in a BASIC program, the more time it will take the interpreter to find each one. To make the program run as quickly as possible the most often used subroutine, the one that moves the attackers, has been put at the start so that BASIC can find it quickly when it searches through memory for a given line. The program has been written in a number of small subroutines. This slows it down slightly but makes it much easier to test or to modify for a different type of computer since the writing can be done piece by piece and the routines can be tested one at a time. Unfortunately as it is a game using graphics it will not be possible to enter it straight onto other machines, except a TRS-80 level II, which should run it without changes.

Whenever possible, sensible names have been chosen for variables to make debugging the program easier — for example, temporary variables start with 'T', V and H contain vertical and horizontal co-ordinates, and so forth. The 'X' co-ordinate of an attacker is set to zero when it is destroyed.

T,T1,T2	:	Temporary results
CT	:	Number of cities remaining
CA	:	Attacker move count
P	:	Position on screen
XL,YL	:	Range of bomb blast
K$	:	Last character from keyboard
AB	:	Atom bombs remaining
NB	:	Neutron bombs remaining
HB	:	Hydrogen bomb stocks
SC	:	Score (Devastation Rating)
CH	:	Explosion character
SK	:	Skill rating
VA	:	The constant 15360 — address of the start of screen memory
XP,YP	:	Top left X and Y co-ordinates hit by a missile
AX( ),AY( )	:	Attackers X and Y co-ordinates (X positions 0-63, Y 1-15)
V,H	:	Vertical & Horizontal aiming co-ordinates (V 0-47, H 0-127)
FL	:	A 'flag' set to zero when only one attacker is to be moved

Particular statements that may seem odd are as follows:

CLS The command to clear the display.

DEFINT A-Z Makes all variables other than K$ be stored as integers (whole numbers only), to speed up the program.

SET(X,Y) Turns on (white) a point on the screen. X is a value between 0 and 127 and Y can be between 0-47. SET(0,0) turns on the point in the top left corner of the screen.

RESET(X,Y) The reverse of SET — it turns a point on a 0-127,0-47 matrix black. If the point is black already RESET has no effect.

PRINT @ X, Moves the printing cursor to position X on the screen. As it is made up of 16 lines of 64 characters, X can be any value between 0 (top left) and 1023 (bottom right).

(PEEK(P)<>42) This expression lets you look into the screen memory. P is the place in memory: P-15360 would tell you where to PRINT @ if you wanted to print a character there. The function returns 0 if the memory cell at P contains 42 or −1 if it does not. (42 is the character code for '*'.)

POKE P,191 Puts a character code 191 at location P in memory. This can be the same as a PRINT @ P-15360, except that it allows you to display characters that can't be typed directly on the Video Genie keyboard — Code 191 is an all-white block.

K$=INKEY$ Reads in the current key being pressed on the keyboard — it returns a Null (empty) string if no keys are down. On a PET use the GET statement — GET on an Apple does a different thing so use "K$=CHR$(PEEK(−16384)) : POKE −16368,0".

RND(N) Returns a random whole number between 1 and N. RANDOM at the start of the program will make sure that each game has a different sequence of random numbers. An RND statement is also used in one of the keyboard loops to vary the sequence.

Summary

To conclude, a few tips on how to succeed when playing the game. It is sometimes useful to lay down a barrage of missiles across the screen to act as a net to stop the advancing forces. As 'H' bombs and 'A' bombs leave some areas permanently 'radioactive' they can be used like landmines (!) in the hope that the attackers will walk into them. This will filter out some of them, leaving the rest to be individually blasted with the 'N' bombs. At the higher 'Skill Ratings' you may not be able to do this as you will not have enough weapons. The main weakness of that strategy is that it increases your score since you will have to blast large areas to make a reasonable net, but it can save cities in the long run. The targeting system generates one of the standard military problems — by the time you've taken aim the enemy have moved somewhere else! If after you have set a horizontal line of fire the enemy move out of range, you can abort the launching of your missile by not pressing any key during the vertical radar scan. The horizontal scan will restart without any missile being launched. 'Deflection shooting' will make it easier to hit the targets — try to judge how often and how far they move and aim ahead of them accordingly.

Program Listing

```
100 REM**PRINT RULES AND SET UP SCREEN
110 GOTO 1710
120 REM**MOVE ATTACKERS
130 T=0
140 CA=(CA<12)*-CA
150 IF AX(CA)=0 THEN 260
160 POKE VA+AX(CA)+AY(CA)*64,32
170 AX(CA)=AX(CA)-RND(3)+1
180 AY(CA)=AY(CA)+RND(3)-2
190 IF AY(CA)<1 THEN AY(CA)=1
200 IF AY(CA)>15 THEN AY(CA)=14
210 T1=PEEK(VA+AX(CA)+AY(CA)*64)
220 IF T1=42 THEN CT=CT-1:SC=SC+40
230 IF T1>128 THEN AX(CA)=0
240 IF AX>0 THEN POKE VA+AX(CA)+AY(CA)*64,60
250 IF AX(CA)<18 THEN 2230
260 CA=CA+1:T=T+1
270 IF T<4 AND FL THEN 140
280 RETURN
290 REM**SEE IF BOMB STRUCK ATTACKER
300 P=P-VA
310 YP=P/64
320 XP=P-YP*64
330 IF K$="H" THEN XL=2:YL=1:GOTO 350
340 XL=1:YL=0
```

```
350 FOR Y=YP TO YP+YL
360 FOR X=XP TO XP+XL
370 FOR T=0 TO 11
380 IF AY(T)=Y AND AX(T)=X THEN AX(T)=0
390 SC=SC-30
400 NEXT T
410 NEXT X
420 NEXT Y
430 RETURN
440 REM**SCAN THE KEYBOARD
450 K$=INKEY$
460 IF K$="" OR K$="N" OR K$="H" OR K$="A" THEN RETURN
470 K$="":RETURN
480 REM**VERTICAL DISPLAY SCAN
490 V=4
500 SET(32,V+1)
510 GOSUB 450
520 FL=0
530 GOSUB 140
540 FL=1
550 IF K$<>"" OR V>42 THEN RETURN
560 RESET(32,V+1)
570 V=V+3
580 GOTO 500
590 REM**HORIZONTAL DISPLAY
600 H=32
610 SET(H,1)
620 GOSUB 450
630 IF K$<>"" OR H>119 THEN RETURN
640 RESET(H,1)
650 H=H+2
660 GOTO 610
670 REM**DROP AN 'A' BOMB
680 IF AB<1 THEN 870
690 SC=SC+20
700 AB=AB-1
710 GOSUB 1430
720 T=(PEEK(P)=42) OR (PEEK(P+1)=42)
730 IF T THEN SC=SC+100
740 CT=CT+T
750 FOR T=0 TO 3
760 IF T=0 OR T=2 THEN CH=153:GOTO 780
770 CH=32
780 POKE P,CH
790 POKE P+1,CH
800 GOSUB 1460
810 NEXT T
820 POKE P,162
830 POKE P+1,145
840 GOSUB 300
850 RETURN
860 REM**NONE OF THOSE BOMBS
870 PRINT @960,"OUT OF ";K$;" BOMBS";
880 IF AB+HB+NB<1 THEN 2260
890 GOSUB 130
900 GOSUB 130
910 GOSUB 130
920 PRINT @960,"[15 SPC]";
930 REM**BOMB DROPPED, MOVE ENEMY
940 RESET(H,1)
950 RESET(32,V+1)
960 GOSUB 260
970 RETURN
980 REM**DROP AN 'H' BOMB
990 IF HB<1 THEN 870
1000 SC=SC+50
1010 HB=HB-1
1020 GOSUB 1430
1030 T=(PEEK(P)=42) OR (PEEK(P+1)=42)
1040 T=(PEEK(P+2)=42) OR (PEEK(P+64)=42) OR T
1050 T=(PEEK(P+65)=42) OR (PEEK(P+66)=42) OR T
1060 IF T THEN SC=SC-100*T
1070 CT=CT+T
1080 FOR T=0 TO 3
1090 IF T=0 OR T=2 THEN CH=155:GOTO 1110
1100 CH=32
1110 POKE P,CH
1120 POKE P+2,CH
1130 POKE P+65,CH
1140 POKE P+1,CH
1150 POKE P+64,CH
1160 POKE P+66,CH
1170 GOSUB 1460
1180 NEXT T
1190 POKE P,188
1200 POKE P+66,143
1210 POKE P+2,188
1220 POKE P+64,143
1230 GOSUB 300
1240 RETURN
1250 REM**DROP AN 'N' BOMB
1260 IF NB<1 THEN 870
1270 SC=SC+15
1280 NB=NB-1
1290 GOSUB 1430
1300 T=(PEEK(P)=42) OR (PEEK(P+1)=42)
1310 IF T THEN CT=CT+T
1320 SC=SC+100
1330 FOR T=0 TO 3
1340 IF T=0 OR T=2 THEN CH=191:GOTO 1360
1350 CH=32
1360 POKE P,CH
1370 POKE P+1,CH
1380 GOSUB 1460
1390 NEXT T
1400 GOSUB 300
1410 RETURN
1420 REM**CONVERT AN SET TO A POKE
     (PASS H,V - RETURNS P)
1430 P=VA+H/2+(INT(V/3)*64
```

```
1440 RETURN
1450 REM**SEE IF ALL ENEMIES ARE DEAD (DELAY)
1460 T1=0
1470 FOR T2=0 TO 11
1480 T1=T1+AX(T2)
1490 NEXT T2
1500 IF T1=0 THEN 2430
1510 RETURN
1520 REM**MAIN CONTROL LOOP
1530 GOSUB 130
1540 GOSUB 600
1550 GOSUB 130
1560 GOSUB 490
1570 GOSUB 1460
1580 IF K$="N" THEN GOSUB 1260
1590 IF K$="A" THEN GOSUB 680
1600 IF K$="H" THEN GOSUB 990
1610 GOSUB 1640
1620 GOTO 1530
1630 REM**UPDATE THE SCORES
1640 PRINT @135,HB;
1650 PRINT @199,AB;
1660 PRINT @263,NB;
1670 PRINT @391,SC;
1680 PRINT @519,CT;
1690 RETURN
1700 REM**DISPLAY INSTRUCTIONS
1710 RANDOM
1720 DEFINT A-Z
1730 DIM AX(12),AY(12)
1740 CLS
1750 PRINT"((( 20 X ((( D E V A S T A T I O N )))))))))"
1760 PRINT:PRINT
1770 PRINT"YOU MAY DROP 'N' BOMBS, 'H' BOMBS & GOOD
     OLD-FASHIONED 'A' BOMBS"
1780 PRINT"ON THE CITIES OF YOUR BELOVED COUNTRY,
     HOPING TO MISS THEM & HIT"
1790 PRINT"THE MOVING ARROWS REPRESENTING ENEMY
     INVADERS."
1800 PRINT"H BOMBS DESTROY THE LARGEST AREA AND
     NEUTRON (N) BOMBS THE LEAST"
1810 PRINT"AS THEY DO NOT LEAVE PERMANENT DAMAGE."
1820 PRINT"YOU MUST DESTROY ALL THE ENEMIES, WITHOUT
     LETTING THEM CROSS THE"
1830 PRINT"COUNTRY FROM EAST TO WEST - BLOWING UP YOUR
     COUNTRY AS LITTLE AS"
1840 PRINT"POSSIBLE.  TO FIRE A BOMB PRESS THE
     APPROPRIATE LETTER WHEN YOUR"
1850 PRINT"HORIZONTAL AND VERTICAL SIGHTS INDICATE THE
     CORRECT CO-ORDINATES"
1860 PRINT"PRESS THE KEY WHILE THE SIGHTS ARE MOVING
TO CHOOSE WHERE TO STOP"
1870 PRINT
1880 PRINT"ENTER YOUR SKILL RATING WHEN YOU WANT TO
     START - BETWEEN 0 AND 9"
1890 K$=INKEY$
1900 T=RND(10)
1910 IF K$="" THEN 1890
1920 IF K$<"0" OR K$>"9" THEN 1890
1930 SK=VAL(K$)
1940 REM**SET UP THE BATTLEFIELD
1950 T=0
1960 HB=4-SK/3:AB=14-SK:NB=18-SK
1970 SC=0:CT=14
1980 CLS
1990 CA=0:VA=15360:FL=1
```

The length of this program can be considerably decreased by using the ELSE statement on TRS-80s and Video Genies. It has been deliberately omitted to make conversion easier.

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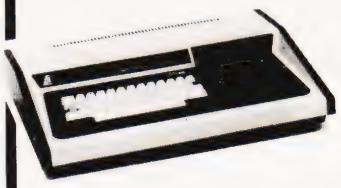

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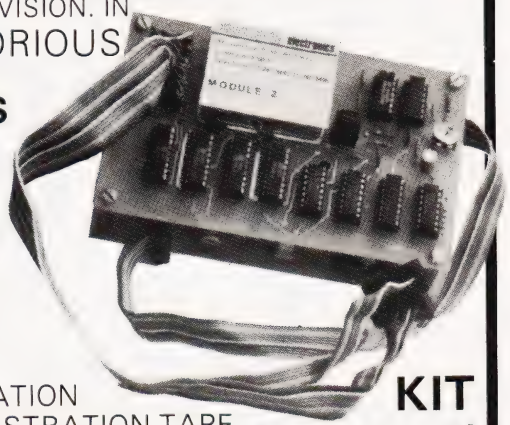

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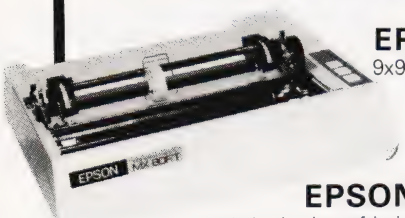

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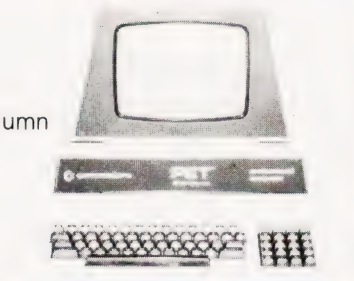

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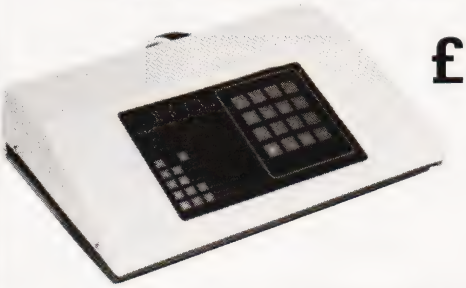

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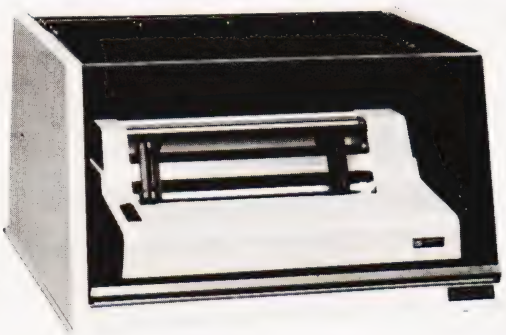

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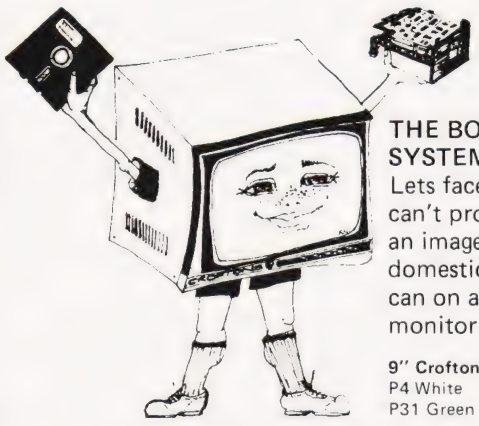

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ZALAMBDODONT

Friedman Wagner-Dobler

If you have problems manipulating numbers and codes in the various bases then this Z80 program may well make life easier.

ZALAMBDODONT, in case you wondered, stands for 'Z80 All Singing All Dancing Pocket Calculator' (only the first two letters are significant). You already have three pocket calculators? Well, if yours can perform arithmetic and Boolean operations on binary, octal, decimal, hexadecimal, ASCII and Boolean values, then you don't need Zalambdodont — otherwise you probably do. Let me introduce you to Zalambdodont by showing you how it works.

Operations

When Zalambdodont is first entered, input is interpreted as hexadecimal by default. Consequently, if you type '1A * B1 [CR]', the program will respond with '= 2BEH' (on the same line, for greater legibility), telling you that 1A multiplied by B1 is 2BE (Hex). As in most BASICs an asterisk is used as the operator for multiplication. You may use any of the following operators:

ARITHMETIC
- * Multiplication
- / Division
- − Subtraction
- + Addition

BOOLEAN
- & AND
- V Inclusive OR (one or the other or both)
- X Exclusive OR (one or the other but not both)

Note that there is no order of precedence — '2+2*4' is 16, not 10. However, any number of brackets are allowed.

You may also use five operators designating unary functions:
- + Positive Sign
- − Negative Sign (two's complement)
- ! Negation (one's complement)
- < Shift to the left
- > Shift to the right

These operators refer to the value (or expression in brackets) immediately following them.

Identifiers

Zalambdodont allows you to mix its six data types in any way you want, providing you make clear what you mean. You do so by using identifiers preceding the value in question. Legal identifiers are:
- 0 Decimal
- . Binary (the smallest of them all)
- % Octal (looks like an 8)
- H Hexadecimal
- " ASCII (followed by an ASCII character)
- ' Boolean

The Prompt

The prompt, two letters followed by a space, tells you what the current input/output default values are. Initially, the prompt is 'HH'; however, you may change the input default by typing 'I [any identifier] [CR]'. For instance, type 'I 0 [CR]', and the next prompt will be '0H'. Anything not preceded by an identifier will be interpreted as decimal, though the result will still be printed in Hex — for instance, '12*12' will yield the result 90H. Incidentally, if at any time you want to know the decimal equivalent of the result, type a [CR] on its own. If you want to know the result in a number base other than the current output default, type the identifier in question (except 0) followed by a [CR]. If you want to switch output generally to another data type, type '0 [any identifier] [CR]'.

There are two possible error messages: 'ERROR' and 'OVERFLOW ERROR'. They will be followed by the line printed up to the point where the error occurred, eg:

```
0H 123+"M+%36+JOKE=ERROR
   ??  123+"M+%36+J?
```

since (sad though it may be) JOKE is not recognised as a valid piece of data. Overflows are not implemented except for input and multiplication of numbers which cannot be held in 16 bits. The reason is that you may be interested to know what happens if you form the two's complement of 8000H (nothing) and in any case, who tells Zalambdodont whether you are working with signed or unsigned numbers? Beware of multiplying and dividing large numbers, though — they will be treated as signed numbers and you may get spurious results. The reason is that you may want to treat numbers above 7FFFH as either signed or unsigned. However, Zalambdodont will warn you if your number can be interpreted as signed. If you type 'H 9F7E [CR]', the response will be '= 9F7E (−)' — in other words, 9F7E can be interpreted as a negative number. There are two ways to find out which number: first, you can type '— Z [CR]'. 'Z' is a variable the value of which is always the last result. In this case, the answer will be '6082H'. This method is slightly cumbersome and also changes the value of Z. Second, you can type '— [CR]', which does the same

thing without changing Z. If you want to see the result in a number base other than the current output default, an identifier typed after '—' will do just that.

Initialising

Zalambdodont occupies just over 900 bytes (decimal — NOT Hex!) not counting the input buffer at the end of the program. It is designed as a subroutine and, assembled at 7800H, should work on any Z80 based system where that area is occupied by usable RAM (eg TRS-80 16K, Sorcerer 32K. For smaller machines you will have to relocate the program (eg for a TRS-80 4K, subtract 4000H from all addresses).

The input/output routines given are those for 16K Level II TRS-80. For other machines, you will have to modify locations 'ENTRY' to 'START'. For the Sorcerer, the following changes have to be made:

```
RECEVE: CALL 0E009H
JR Z, RECEVE
7 * 'NOP'
SEND1: JP 0E00CH
7 * 'NOP'
CTRLCH: CP 3 (Ctrl-C is 3 on the
Sorcerer)
```

The routine can then be called by a GO command ('/' for the Tandy) or by a BASIC USR call. Press the BREAK key to return to the calling program — the stack will not be disturbed even when catastrophic errors have occurred during execution. However, be warned that the program makes heavy use of the stack and something like 50 bytes of stack space should be available for complicated expressions.

How It Works

There are two main parts in the program: the routine from 78B9 through 7AEB evaluates an expression beginning at (IX). It is completely self-contained except for the error jumps, so if you want to build your own Tiny BASIC, this is your chance.

The rest of the program provides for the change of input/output default values, printout, line input and so on. It is a bit messy, so I will pass it over in silence! However, note the print routines from 7AEC. The object was to provide readable output, never mind speed. The solution was to fill in a print buffer, consisting of nulls, two commas and a semicolon. This results in a number of superfluous nulls being sent, but the difference between 111,0000;1000,0010 and 111000010000010 or 12876 and 12,876 is, I think, worth it.

The two routines starting at 7ACA and 7AE3 are Zalambdodont's lifeblood. For instance, at 7925 we want to find out whether the next character is valid operator. Assuming '+' is in the A register, the instruction CALL SEARCH will bring us to 792C with IY containing 0, Carry off and all main registers unchanged. Had the contents of A been '*', IY would be 2, and so on. For any legal operator, then, control will transfer to PUSHIT, which pushes IY and HL on the stack. GETNO is then called which returns with HL containing the value of the next number on the line. The next two instructions will POP the previous result into DE and the previous operator code back into IY. Let us assume that the expression was '3 * 11'. DE will contain 3, HL 11, and IY 2. Now, OPERTN is called. The first thing this routine does is to call ONGOTO, which adds IY*2 to the return address (which is destroyed) and jumps there. Consequently control will transfer to JR OPMUL, UPMUL will put 3*11 = 33 into HL and the RET at 7A0C will bring us back to 791E. Again we look for the next character. If this is a carriage return we are finished and return to 78CA, from where the evaluation routine was called in the first place. The two instructions following BEGIN do nothing but initialise — in effect every expression is written as '0 + expression'.

Provided you are clear about how SEARCH and ONGOTO work, the rest of the program should be relatively easy to understand. Nevertheless, if you have been brought up BASICally, the CALL BEGIN at 7951 will probably horrify you. What happened is that what we expected to be a number turned out to begin with a '('. A bracket, of course, may in itself contain an expression, and the most elegant solution to this is a recursive function call. No harm will be done providing the calling routine and the called routine (which are identical) do not interfere with each other; in our case the previous result is on the stack and all is well. We must, however, make sure that when '(' occurs, control returns to 7954 (hence 792E) and that an expression in brackets is terminated by a bracket (hence 7954-7). A similar recursive function call is, incidentally, contained in 795B.

I hope it will only take you (%433+(<<< ''A V''a))/.11110 minutes to enter the program and that you will think my claim that Zalambdodont makes life easier is !(!(F X T) & (T V (T & F))).

Program Listing

```
                0040 ; ************************
                0050 ; *                      *
                0060 ; *ZALAMBDODONT V. 564.1 *
                0070 ; *                      *
                0080 ; *      FRIEDMAN        *
                0090 ; *   WAGNER-DOBLER      *
                0100 ; ************************
                0110 ;
                0120 ; ASCII EQUATES
                0130 ;
000D            0140 CR       EQU 0DH       ;CARRIAGE
                                             RETURN/ENTER
000A            0150 LF       EQU 0AH       ;LINE FEED
0020            0160 SPACE    EQU ' '
0001            0170 CTRLC    EQU 1         ;BREAK KEY
                0180
                0190 ; PROGRAM EQUATES
                0200
0080            0210 ENDING   EQU 80H       ;END MARKER
                0220
0040            0230 LOGBIT   EQU 64        ;USED TO DETER-
                                             MINE
0020            0240 ASCBIT   EQU 32        ;TYPE OF
                                             OPERANDS
0010            0250 HEXBIT   EQU 16
0008            0260 OCTBIT   EQU 8
0002            0270 BINBIT   EQU 2
000A            0280 DECBIT   EQU 10
                0290
                0300
0000            0310          ASEG
                0320          ORG 7800H
                0330
7800  18 20     0340 ENTRY:   JR ENTRY 1    ;FOUR ROUTINES
                                             MUST BE HERE
7802  18 19     0350 EXIT:    JR EXIT 1
7804  18 0D     0360 SEND:    JR SEND 1
7806  D5        0370 RECEVE:  PUSH DE       ;GET ONE
                    ; CHARACTER FROM KEYBOARD
7807  FD E5     0380          PUSH IY       ;DO NOT ECHO
                                             CHARACTER
7809  CD 00 2B  0390 AGN:     CALL 2BH      ;DO NOT RETURN
                                             UNTIL CHAR TYPED
780C  B7        0400          OR A          ;RETURN CHAR IN
                                             A REG
780D  28 FA     0410          JR Z,AGN
780F  FD E1     0420          POP IY
7811  D1        0430          POP DE
```

Quick Reference Chart

All numbers are given in decimal unless otherwise indicated.

Legal Statements: I [ID] [CR], O [ID] [CR], [ID] [CR], [CR], — [ID] [CR], Expression.

IDENTIFIER	BASE	TYPE	EXAMPLE
0	10	Decimal	010 = 10
%	8	Octal	%10 = 8
H	16	Hexadecimal	H123 = 291
.	2	Binary	.11011 = 27
"	—	ASCII	"X = 88
'	—	Boolean	'T = −1 (True) 'F = 0 (False)

OPERATORS	OPERATION	EXAMPLE
*	Multiplication	12*12 = 144
/	Division	145/13 = 11
−	Subtraction	100-12 = 88
+	Addition	1234 + 6 = 1,240
&	Boolean AND	.1100&.1010 = 1000.
V	Inclusive OR	.1100V.1010 = 1110.
X	Exclusive OR	.1100X.1010 = 0110.
+	Positive Sign	+12 = 12
− (Two's complement)	Negative Sign	−12 = 65,524 (−) = −12
! (One's complement)	Negation	!12 = 65,523 (−) = −13
<	Shift left	<.1101 = 1,1010.
>	Shift right	>.111 = 11

```
7812 C9          0440           RET
7813 D5          0450 SEND1:    PUSH DE        ;SEND CHARACTER
                                                IN A REG
7814 FD E5       0460           PUSH IY        ;TO OUTPUT
                                                DEVICE
7816 CD 00 33    0470           CALL 33H
7819 FD E1       0480           POP IY
781B D1          0490           POP DE
781C C9          0500           RET
781D FD E1       0510 EXIT1:    POP IY         ;RESTORE ALL
                                                NECESSARY
781F DD E1       0520           POP IX         ;REGISTERS
7821 C9          0530           RET
7822 DD E5       0540 ENTRY1:   PUSH IX        ;SAVE ALL
                 ; NECESSARY REGISTERS
7824 FD E5       0550           PUSH IY        ;SAVE ALL
                 ; NECESSARY REGISTERS
7826 ED 73 7A C4 0560           LD (STSAVE),SP ;MUST SAVE
                 ; STACKPOINTER THERE
782A CD 78 E7    0570 START:    CALL CRLF      ;BEGIN NEW LINE
782D 3A 7A C3    0580           LD A,(IPRMPT)  ;SEND FIRST
                                                ;PROMPT
7830 CD 78 04    0590           CALL SEND
7833 3A 7A C9    0600           LD A,(OPRMPT)  ;SEND SECOND
                                                ;PROMPT
7836 CD 78 04    0610           CALL SEND
7839 3E 20       0620           LD A,SPACE     ;AND A SPACE
783B CD 78 04    0630           CALL SEND
                 0640 ; GET A LINE FROM KEYBOARD. LINE ENDS
                 ; WHEN CR ENCOUNTERED
783E 21 7B 8D    0650 LINEIN:   LD HL,BUFFER
7841 CD 78 06    0660 INPUT:    CALL RECEVE
7844 FE 20       0670           CP SPACE       ;IS IT CONTROL-
                                                ;CHAR?
7846 38 07       0680           JR C,CTRLCH
7848 CD 78 04    0690           CALL SEND      ;NO - SEND &
                                                ;CONTINUE
784B 77          0700           LD (HL),A      ;SAVE IN BUFFER
784C 23          0710           INC HL         ;POINT TO NEXT
                                                ;LOCATION
784D 18 F2       0720           JR INPUT       ;GET NEXT
                                                ;CHARACTER
784F FE 01       0730 CTRLCH:   CP CTRLC
7851 28 AF       0740           JR Z,EXIT
7853 FE 0D       0750           CP CR
7855 20 EA       0760           JR NZ, INPUT   ;IGNORE CTRLCH
                                                ;EXCEPT CR
7857 77          0770           LD (HL),A      ;WE'VE GOT THE
                                                ;LINE
7858 DD 21 7B 8D 0780           LD IX,BUFFER   ;SET POINTER TO
                                                ;BEG OF BUFFER
785C 21 78 2A    0790           LD HL,START    ;RETURN ADDRESS
                 0800 ; FOR ALL THAT FOLLOWS
785F E5          0810           PUSH HL
7860 3E 20       0820           LD A,SPACE
7862 CD 78 04    0830           CALL SEND      ;SEND SPACE TO
                                                ;FOLLOW LINE
                 0840 ; CHECK WHETHER I/O DEFAULT TO BE
                 ; CHANGED
                 0850 ; ALSO CHECK FOR PRINT COMMANDS
                 ; (ID/ENTER)
7865 2A 7A C6    0860           LD HL,(RESULT) ;GET PREVIOUS
                                                ;RESULTS
7868 CD 7A 19    0870           CALL SCAN&I
786B CD 7A CA    0880           CALL SEARCH
786E 4F 49 2D 0D 0890           DB 'OI-',CR,'000' ;PADDED WITH O's
7872 4F 4F 4F
7875 38 0E       0900           JR C,IDFCR?
7877 CD 7A E3    0910           CALL ONGOTO
787A 18 13       0920           JR SETOUT      ;IF LETTER WAS O
787C 18 19       0930           JR SETIN       ;IF LETTER WAS I
787E 18 IF       0940           JR PRTNEG      ;IF LETTER WAS -
7880 01 30 0A    0950 PRTDEC:   LD BC,300AH    ;IF LETTER WAS CR
                 0960                          ;BC = ASC '0' +
                                                ;DECBIT
7883 18 50       0970           JR PRNTIT      ;PRINT RESULT IN
                                                ;DEC
7885 CD 7A B0    0980 IDFCR?:   CALL IDNTF0
7888 38 2F       0990           JR C,MAINPR
788A CD 78 B4    1000           CALL CR?       ;MUST BE
                                                ;FOLLOWED BY CR
788D 18 46       1010           JR PRNTIT
788F CD 78 AC    1020 SETOUT:   CALL IDF&CR    ;GET NEW OUTPUT
                                                ;DEFAULT
7892 ED 43 7A C8 1030           LD (ODEFLT),BC ;AND SAVE IT
7896 C9          1040           RET
7897 CD 78 AC    1050 SETIN:    CALL IDF&CR
789A ED 43 7A C2 1060           LD (IDEFLT),BC ;SAME FOR INPUT
                                                ;DEFAULT
789E C9          1070           RET
789F CD 79 72    1080 PRTNEG:   CALL CMPLM2    ;HL = −HL
78A2 CD 7A 19    1090           CALL SCAN&I
78A5 28 2A       1100           JR Z,PRTODF    ;PRINT USING
                                                ;DEFAULT VALUES
78A7 CD 78 AF    1110           CALL AIDFCR
78AA 18 29       1120           JR PRNTIT      ;PRINT USING
                                                ;SUPPLIED ID
78AC CD 7A 19    1130 IDF&CR:   CALL SCAN&I
78AF CD 7A 8B    1140 AIDFCR:   CALL IDENTF
78B2 38 04       1150           JR C,GOMAIN    ;LINE CONTAINS
                                                ;EXPRESSION
78B4 CD 7A 19    1160 CR?       CALL SCAN&I
78B7 C8          1170           RET Z          ;ONLY RETURNS
                                                ;WHEN CR PRESENT
78B8 E1          1180 GOMAIN:   POP HL         ;DESTROY RETURN
                 1190                          ;ADDRESS
1200             ; WASN'T I/O OR PRINT COMMAND, SO MUST
                 ; BE AN EXPRESSION
                 1210
78B9 DD 21 7B 8D 1220 MAINPR:   LD IX,BUFFER
78BD 3E 3D       1230           LD A,'='       ;SEND '='
78BF CD 78 04    1240           CALL SEND
78C2 3E 20       1250           LD A,SPACE
78C4 CD 78 04    1260           CALL SEND
78C7 CD 79 0B    1270           CALL BEGIN     ;CALL EVALUATION
                                                ;ROUTINE
78CA FE 0D       1280           CP CR          ;EXPRESSION MUST
                                                ;END IN CR
78CC 20 28       1290           JR NZ,ERROR
78CE 22 7A C6    1300           LD (RESULT),HL ;SAVE RESULT
78D1 ED 4B 7A C8 1310 PRTODF:   LD BC,(ODEFLT) ;GET OUTPUT
                                                ;DEFAULT
78D5 CD 7A EC    1320 PRNTIT:   CALL LDPRBF    ;LOAD PRINT
                                                ;BUFFER
78D8 EB          1330           EX DE,HL       ;GET START OF
                                                ;MESSAGE IN HL
78D9 7E          1340 MESOUT:   LD A,(HL)      ;SEND MESSAGE
                                                ;BEGINNING AT (HL)
78DA 23          1350           INC HL
78DB B7          1360           OR A           ;SET FLAGS
78DC F8          1370           RET M          ;END MARKER
                                                ;ENCOUNTERED
78DD CD 78 04    1380           CALL SEND      ;NO — SEND IT
78E0 FE 0D       1390           CP CR
```

```
78E2  CC 78 EC     1400            CALL Z,LINFID   ;CR — SEND
                                                   ;LINEFEED AS WELL
78E5  18 F2        1410            JR MESOUT       ;CONTINUE
78E7  3E 0D        1420 CRLF:      LD A,CR         ;SEND CR AND LF
78E9  CD 78 04     1430            CALL SEND
78EC  3E 0A        1440 LINFID:    LD A,LF
78EE  C3 78 04     1450            JP SEND         ;RETURN THERE
                   1460
                   1470 ; PROCESS ERRORS
                   1480
78F1  21 7B 7B     1490 OVFLOW:    LD HL,OVFLMS
78F4  18 03        1500            JR ERR1
78F6  21 7B 84     1510 ERROR:     LD HL,ERRMSG
78F9  DD 36 00 3F  1520 ERR1:      LD (IX),'?'     ;MARK POINT
                                                   ;WHERE ERROR
78FD  DD 36 01 80  1530            LD(IX+1),ENDING ;NEXT CHAR END
                                                   ;OF MESSAGE
7901  ED 7B 7A C4  1540            LD SP,(STSAVE)  ;RESTORE STACK-
                                                   ;POINTER
7905  CD 78 D9     1550            CALL MESOUT
7908  C3 78 2A     1560            JP START        ;READY FOR NEXT
                                                   ;ERROR
                   1570 ; EVALUATE EXPRESSION BEGINNING AT (IX).
                        ; RETURN WITH
                   1580 ; RESULT IN HL AN IN A
790B  21 00 00     1590 BEGIN:     LD HL,0         ;SET PREVIOUS
                                                   ;RESULT TO 0
790E  FD 21 00 00  1600            LD IY,0         ;AND OPERATOR
                                                   ;TO '+'
7912  FD E5        1610 PUSHIT:    PUSH IY         ;SAVE PREVIOUS
                                                   ;OPERATOR
7914  E5           1620            PUSH HL         ;AND PREVIOUS
                                                   ;RESULT
7915  CD 79 33     1630 GETXPR:    CALL GETNO
7918  D1           1640            POP DE          ;PREVIOUS HL
7919  FD E1        1650            POP IY
791B  CD 79 D1     1660            CALL OPERTN     ;PERFORM +, -,
                                                   ;ETC.
791E  CD 7A 19     1670            CALL SCAN&I
7921  C8           1680            RET Z           ;CR — END OF
                                                   ;EXPRESSION
7922  CD 7A CA     1690            CALL SEARCH     ;NOT YET FINISHED
7925  2B 2D 2A 2F  1700            DB '+-*/&VX     ;GET NEXT
7929  26 56 58                                     ;OPERATOR
792C  30 E4        1710            JR NC,PUSHIT    ;NEXT PLEASE
792E  FE 29        1720            CP ')'          ;CLOSE BRACKET?
7930  C8           1730            RET Z           ;RETURN TO 7954H
7931  18 C3        1740 SNERR:     JR ERROR        ;ELSE MUST BE SN
                                                   ;ERROR
                   1750 ; CONVERT NUMBER BEGINNING AT (IX) INTO
                   1760 ; CONTENTS OF HL REGISTER.
7933  21 00 00     1770 GETNO:     LD HL,0         ;CLEAR RESULT
                                                   ;AREA
7936  CD 7A 19     1780            CALL SCAN&I     ;SCAN BUFFER
                                                   ;AREA
7939  CD 7A CA     1790            CALL SEARCH
793C  2B 2D 21 3C  1800            DB '+-!<>Z('    ;PRECEDED BY OP?
7940  3E 5A 28
7943  38 3B        1810            JR C,NMBOK      ;NO — TRY NUMBER
7945  FE 28        1820            CP '('          ;SPECIAL
                        ; PROCEDURE FOR BRACKETS
7947  28 08        1830            JR Z,BRAKET
7949  FE 5A        1840            CP 'Z'          ;AND FOR 'Z'
                                                   ;(PREVIOUS RESULT)
794B  20 0C        1850            JR NZ,UNARY
                   1860 ; PREVIOUS RESULT
794D  2A 7A C6     1870            LD HL,(RESULT)
7950  C9           1880            RET
                   1890 ; OPEN BRACKET
7951  CD 79 0B     1900 BRAKET:    CALL BEGIN      ;GET EXPRESSION
                                                   ;IN ( )
7954  FE 29        1910            CP ')'
7956  20 D9        1920            JR NZ,SNERR     ;MUST END IN )
7958  C9           1930            RET
                   1940 ; UNARY OPERATORS
7959  FD E5        1950 UNARY:     PUSH IY         ;SAVE DISPLACE-
                                                   ;MENT
795B  CD 79 33     1960            CALL GETNO      ;GET OPERAND
795E  FD E1        1970            POP IY
7960  CD 7A E3     1980            CALL ONGOTO     ;DO OPERATION
7963  C9           1990            RET
7964  00           2000            NOP             ;IGNORE UNARY '+'
7965  18 0B        2010            JR CMPLM2       ;UNARY '-'
7967  18 0E        2020            JR NEGATE       ;NEGATION -'!'
7969  18 05        2030            JR LFTSHF       ;SHIFT LEFT -'<'
796B  CB 3C        2040 RGHTSH:    SRL H           ;SHIFT RIGHT -'>'
796D  CB 1D        2050            RR L
796F  C9           0260            RET
7970  29           2070 LFTSHF:    ADD HL,HL       ;SHIFT LEFT BY
                                                   ;ADDING TO ITSELF
7971  C9           2080            RET
7972  CD 79 77     2090 CMPLM2:    CALL NEGATE
7975  23           2100            INC HL          ;TWO'S COMPLE-
                        ; MENT = ONE'S COMPLEMENT +1
7976  C9           2110            RET
7977  F5           2120 NEGATE:    PUSH AF
7978  7D           2130            LD A,L          ;COMPLEMENT L
7979  2F           2140            CPL
797A  6F           2150            LD L,A
797B  7C           2160            LD A,H          ;AND H
797C  2F           2170            CPL
797D  67           2180            LD H,A
797E  F1           2190            POP AF
797F  C9           2200            RET
                   2210
7980  CD 7A B0     2220 NMBOK:     CALL INDTF0
7983  38 03        2230            JR C,NOSCAN     ;DO NOT SCAN IF ID
                                                   ;WAS '0'
7985  CD 7A 19     2240            CALL SCAN&I
7988  CD 7A E3     2250 NOSCAN:    CALL ONGOTO
798B  18 17        2260            JR COMMON       ;COMMON ROUTINE
                                                   ;FOR ALL
798D  18 15        2270            JR COMMON       ;NUMBERS (HEX,
                                                   ;DEC, OCT,
798F  18 13        2280            JR COMMON       ;BIN)
7991  18 11        2290            JR COMMON
7993  18 09        2300            JR ASC
7995  FE 46        2310 LOGXPR:    CP 'F'
7997  C8           2320            RET Z           ;HL CONTAINS 0
                                                   ;(= LOGIC FALSE)
7998  FE 54        2330            CP 'T'
799A  20 95        2340            JR NZ,SNERR     ;MUST BE T OR F
799C  2B           2350            DEC HL          ;-1 = LOGIC TRUE
799D  C9           2360            RET
799E  FE 0D        2370 ASC:       CP CR           ;MUSTN'T BE END
                                                    OF LINE
79A0  28 8F        2380            JR Z,SNERR
79A2  6F           2390            LD L,A
79A3  C9           2400            RET
                   2410 ; CONVERT BIN, OCT, DEC, HEX NUMBERS
                        DEPENDING
                   2420 ; ON CONTENTS OF C REGISTER
79A4  CD 7A 25     2430 COMMON:    CALL DIGIT      ;CHECK FIRST DIGIT
79A7  38 88        2440            JR C,SNERR      ;NOT VALID —
                                                   ;ERROR
79A9  06 00        2450            LD B,0
79AB  85           2460 GETLUP:    ADD A,L
79AC  6F           2470            LD L,A          ;ADD DIGIT TO HL
79AD  7C           2480            LD A,H
79AE  CE 00        2490            ADC A,0         ;ADD PREVIOUS
                                                   ;CARRY
79B0  67           2500            LD H,A
79B1  DD 7E 00     2510            LD A,(IX)       ;GET NEXT
79B4  FE 2C        2520            CP ','          ;COMMA —
                                                    IGNORE IT
79B6  CC 79 C8     2530            CALL Z,INC&LD
79B9  CD 7A 25     2540            CALL DIGIT
79BC  D8           2550            RET C           ;NONE LEFT — END
                                                   ;OF NUMBER
79BD  DD 23        2560            INC IX          ;POINT TO NEXT
79BF  F5           2570            PUSH AF
79C0  CD 7A 58     2580            CALL SMULT      ;MULTIPLY BY
                   2590 ; VALUE OF BASE IN C REG (2, 8, 10, 16)
79C3  38 09        2600            JR C,OVERR
79C5  F1           2610            POP AF
79C6  18 E3        2620            JR GETLUP       ;GET NEXT DIGIT
79C8  DD 23        2630 INC&LD:    INC IX
79CA  DD 7E 00     2640            LD A,(IX)
79CD  C9           2650            RET
                   2660 ; OVERFLOW ERROR JUMP
79CE  C3 78 F1     2670 OVERR:     JP OVFLOW
                   2680 ; HL AND DE CONTAIN VALUES ON WHICH
                        ; OPERATION IS TO BE
                   2690 ; PERFORMED. IY CONTAINS DISPLACEMENT
                        ; (E.G. 0 FOR '+')
79D1  CD 7A E3     2700 OPERTN:    CALL ONGOTO
79D4  18 11        2710            JR OPPLUS
79D6  18 35        2720            JR OPMINS
79D8  18 24        2730            JR OPMUL
79DA  18 14        2740            JR OPDIV
79DC  18 34        2750            JR OPAND
79DE  18 09        2760            JR OPOR
79E0  7D           2770 OPXOR:     LD A,L
79E1  AB           2780            XOR E
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79E2 6F          2790          LD L,A
79E3 7C          2800          LD A,H
79E4 AA          2810          XOR D
79E5 67          2820          LD H,A
79E6 C9          2830          RET
79E7 19          2840 OPPLUS:  ADD HL,DE
79E8 C9          2850          RET
79E9 7D          2860 OPOR:    LD A,L
79EA B3          2870          OR E
79EB 6F          2880          LD L,A
79EC 7C          2890          LD A,H
79ED B2          2900          OR D
79EE 67          2910          LD H,A
79EF C9          2920          RET
79F0 CD 7A 7B    2930 OPDIV:   CALL SIGN
79F3 E5          2940          PUSH HL
79F4 C1          2950          POP BC
79F5 CD 7A 3C    2960          CALL SDIVID     ;RESULT IN DE, SO
79F8 EB          2970          EX DE,HL
79F9 08          2980          EX AF,AF'
79FA FC 79 72    2990          CALL M,CMPLM2
79FD C9          3000          RET
79FE CD 7A 7B    3010 OPMUL:   CALL SIGN
7A01 D5          3020          PUSH DE
7A02 C1          3030          POP BC
7A03 CD 7A 58    3040          CALL SMULT
7A06 38 C6       3050          JR C,OVERR
7A08 08          3060          EX AF,AF'
7A09 FC 79 72    3070          CALL M,CMPLM2
7A0C C9          3080          RET
7A0D B7          3090 OPMINS:  OR A
7A0E EB          3100          EX DE,HL
7A0F ED 52       3110          SBC HL, DE
7A11 C9          3120          RET
7A12 7D          3130 OPAND:   LD A,L
7A13 A3          3140          AND E
7A14 6F          3150          LD L,A
7A15 7C          3160          LD A,H
7A16 A2          3170          AND D
7A17 67          3180          LD H,A
7A18 C9          3190          RET
                 3200 ; SCAN INPUT BUFFER. RETURN WITH FIRST
                      ; NON-BLANK IN
                 3210 ; A REGISTER AN INCREMENT IX. RETURN
                      ; ZERO IF
                 3220 ; CHARACTER IS A CARRIAGE RETURN.
7A19 DD 7E 00    3230 SCAN&I:  LD A,(IX)       ;IX ALWAYS POINTS
                               ;TO BUFFER
7A1C DD 23       3240          INC IX
7A1E FE 20       3250          CP SPACE
7A20 28 F7       3260          JR Z,SCAN&I
7A22 FE 0D       3270          CP CR           ;SET 0 FLAG IF CR
7A24 C9          3280          RET
                 3290 ; CHECK WHETHER CONTENTS OF A REGISTER
                      ; REPRESENTS VALID
                 3300 ; BASE X CHARACTER. BASE IS IN C REGISTER.
                      ; RETURN WITH
                 3310 ; BINARY EQUIVALENT IN A REGISTER. CARRY
                      ; ON IF INVALID.
7A25 D6 30       3320 DIGIT:   SUB '0'         ;ASCII 0 !
7A27 D8          3330          RET C           ;LESS THAN 0 —
                               ;INVALID
7A28 CB 61       3340          BIT 4,C         ;IS IT HEX?
7A2A 28 09       3350          JR Z,NOADJ      ;NO NEED TO
                               ;ADJUST
7A2C FE 0A       3360          CP 10
7A2E 38 05       3370          JR C,NOADJ
7A30 D6 11       3380          SUB 17
7A32 D8          3390          RET C           ;>9 AND <0 —
                               ;NO GOOD
7A33 C6 0A       3400          ADD A,10
7A35 B9          3410 NOADJ:   CP C            ;> = THAN BASE?
7A36 30 02       3420          JR NC,NOPE
7A38 B7          3430 NUMBER:  OR A
7A39 C9          3440          RET
7A3A 37          3450 NOPE:    SCF
7A3B C9          3460          RET
                 3470 ; DIVISION ROUTINE. ENTER WITH DIVISOR
                      ; IN BC
                 3480 ; DIVIDEND IN DE. RETURN WITH RESULT IN DE
                      ; AND REMAINDER
                 3490 ; IN HL. DO NOT DESTROY A REG.
                 3500 ; SEE BARDEN, Z80 MICROCOMP HANDBOOK,
                      ; P 235
7A3C F5          3510 SDIVID:  PUSH AF
7A3D 3E 10       3520          LD A,16
7A3F 21 00 00    3530          LD HL,0
7A42 29          3540 SDIV1:   ADD HL,HL
7A43 EB          3550          EX DE,HL
7A44 29          3560          ADD HL,HL
7A45 EB          3570          EX DE,HL
7A46 30 01       3580          JR NC,SDIV2
7A48 23          3590          INC HL
7A49 B7          3600 SDIV2:   OR A
7A4A ED 42       3610          SBC HL,BC
7A4C 13          3620          INC DE
7A4D F2 7A 53    3630          JP P,SDIV3
7A50 09          3640          ADD HL,BC
7A51 CB 83       3650          RES 0,E
7A53 3D          3660 SDIV3:   DEC A
7A54 20 EC       3670          JR NZ,SDIV1
7A56 F1          3680          POP AF
7A57 C9          3690          RET
                 3700 ; STANDARD MULTIPLICATION ROUTINE.
                      ; ENTER WITH MULTIPLIER
                 3710 ; IN HL AND MULTIPLICAND IN BC. EXIT WITH
                      ; RESULT IN HL
                 3720 ; AND CARRY ON IF RESULT CANNOT BE HELD
                      ; IN 16 BITS.
                 3730 ; ADAPTED SANS BUG FROM BARDEN, P 234
7A58 3E 10       3740 SMULT:   LD A,16
7A5A D5          3750          PUSH DE
7A5B EB          3760          EX DE,HL
7A5C 21 00 00    3770          LD HL,0
7A5F CB 7A       3780 SMUL1:   BIT 7,D
7A61 28 04       3790          JR Z,SMUL2
7A63 09          3800          ADD HL,BC
7A64 30 01       3810          JR NC,SMUL2
7A66 13          3820          INC DE
7A67 3D          3830 SMUL2:   DEC A
7A68 20 08       3840          JR NZ,SMUL3
7A6A 7A          3850          LD A,D
7A6B E6 7F       3860          AND 7FH
7A6D B3          3870          OR E
7A6E D1          3880          POP DE
7A6F C8          3890          RET Z
7A70 37          3900          SCF
7A71 C9          3910          RET
7A72 EB          3920 SMUL3:   EX DE,HL
7A73 29          3930          ADD HL,HL
7A74 EB          3940          EX DE,HL
7A75 29          3950          ADD HL,HL
7A76 30 E7       3960          JR NC,SMUL1
7A78 13          3970          INC DE
7A79 18 E4       3980          JR SMUL1
                 3990 ; SIGN ADJUST. MAKE HL AND DE POSITIVE.
                      ; RETURN WITH
                 4000 ; AF' NEGATIVE IF SIGNS ARE DIFFERENT.
7A7B 7A          4010 SIGN:    LD A,D
7A7C AC          4020          XOR H
7A7D 08          4030          EX AF,AF'
7A7E CB 7C       4040          BIT 7,H
7A80 C4 79 72    4050          CALL NZ,CMPLM2
7A83 EB          4060          EX DE,HL
7A84 CB 7C       4070          BIT 7,H
7A86 C4 79 72    4080          CALL NZ,CMPLM2
7A89 EB          4090          EX DE,HL
7A8A C9          4100          RET
                 4110 ; CHECK WHETHER CHARACTER IN A IS A
                      ; VALID INDENTIFIER.
                 4120 ; RESET CARRY IF IDENTIFIER PRESENT ELSE
                      ; RETURN WITH
                 4130 ; CARRY ON AND RETURN IDEFLT VALUES IN
                      ; BC WITH
                 4140 ; DISPLACEMENT IN IY PROPERLY ADJUSTED.
7A8B CD 7A CA    4150 IDENTF:  CALL SEARCH
7A8E 30 2E 25 48 4160          DB '0.%H"''0'
7A92 22 27 30
7A95 F5          4170          PUSH AF
7A96 FD E5       4180          PUSH IY
7A98 D9          4190          EXX
7A99 11 7A BC    4200          LD DE,COTABL
7A9C FD 19       4210          ADD IY,DE
7A9E D9          4220          EXX
7A9F FD 4E 00    4230          LD C,(IY)
7AA2 47          4240          LD B,A
7AA3 FD E1       4250          POP IY
7AA5 F1          4260          POP AF
7AA6 D0          4270          RET NC
7AA7 F5          4280          PUSH AF         ;SAVE FLAGS AND
                               ;CHAR
7AA8 3A 7A C3    4290          LD A,(IPRMPT)   ;WHICH IS A VALID
                 4300 ; ID SO IF WE NOW
7AAB CD 7A 8B    4310          CALL IDENTIF    ;CONTROL WILL
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                        4320 ; RETURN HERE WITH DEFLT VALUES IN BC
                        4330 ; AND IYPROPERLY ADJUSTED
7AAE F1                 4340            POP AF          ;GET EM BACK
7AAF C9                 4350            RET
                        4360 ; SAME AS IDENTF, BUT CARRY ALSO
                             ; RETURNS ON IF
                        4370 ; IDENTIFIER IS ASC 0
7AB0 CD 7A 8B           4380 IDNTF0:    CALL IDENTF
7AB3 D8                 4390            RET C
7AB4 FE 30              4400            CP '0'
7AB6 28 02              4410            JR Z,SETIT
7AB8 B7                 4420            OR A
7AB9 C9                 4430            RET
7ABA 37                 4440 SETIT:     SCF
7ABB C9                 4450            RET
                        4460
                        4470 ; DATA AREA
                        4480
7ABC 0A                 4490 COTABL:    DB DECBIT
7ABD 02                 4500            DB BINBIT
7ABE 08                 4510            DB OCTBIT
7ABF 10                 4520            DB HEXBIT
7AC0 20                 4530            DB ASCBIT
7AC1 40                 4540            DB LOGBIT
7AC2 10                 4550 IDEFLT:    DB HEXBIT
7AC3 48                 4560 IPRMPT:    DB 'H'
7AC4 00 00              4570 STSAVE:    DW 0
7AC6 00 00              4580 RESULT:    DW 0
7AC8 10                 4590 ODEFLT:    DB HEXBIT
7AC9 48                 4600 OPRMPT:    DB 'H'
                        4610
                        4620
                        4630 ; SEARCH 7 CHARACTER TABLE FOLLOWING
                             ; CALL FOR CHAR
                        4640 ; IN A REG ON ENTRY. RETURN TO ADDRESS
                             ; FOLLOWING
                        4650 ; TABLE, CARRY OFF IF FOUND, CARRY ON IF
                             ; NOT FOUND.
                        4660 ; TALE POSITION OF FOUND CHARACTER - 1
                             ; IN IY.
7ACA D9                 4670 SEARCH:    EXX
7ACB E1                 4680            POP HL          ;RETURN ADDRESS
7ACC 01 00 07           4690            LD BC,7         ;COUNT
7ACF B7                 4700            OR A
7AD0 ED B1              4710            CPIR            ;CARRY FLAG
                                        ; UNAFFECTED
7AD2 08                 4720            EX AF,AF'       ;SAVE IN OTHER REG
7AD3 09                 4730            ADD HL,BC
7AD4 E5                 4740            PUSH HL
7AD5 B7                 4750            OR A
7AD6 21 00 06           4760            LD HL,6
7AD9 ED 42              4770            SBC HL,BC
7ADB E5                 4780            PUSH HL
7ADC FD E1              4790            POP IY
7ADE D9                 4800            EXX
7ADF 08                 4810            EX AF,AF'
7AE0 C8                 4820            RET Z
7AE1 37                 4830            SCF
7AE2 C9                 4840            RET
                        4850 ; ONGOTO
7AE3 D9                 4860 ONGOTO:    EXX
7AE4 D1                 4870            POP DE
7AE5 FD 29              4880            ADD IY,IY
7AE7 FD 19              4890            ADD IY,DE
7AE9 D9                 4900            EXX
7AEA FD E9              4910            JP (IY)
                        4920 ; END OF EVALUATION ROUTINE
                        4930
                        4940 ; LOAD THE PRINT BUFFER. RETURN WITH DE
                             ; POINTING TO
                        4950 ; FIRST CHARACTER. B CONTAINS IDENTIFIER
                             ; (LETTER),
                        4960 ; C CONTAINS IDENTIFIER (CODE).
7AEC EB                 4970 LDPRBF:    EX DE,HL        ;RESULT NOW IN DE
7AED 21 7B 75           4980            LD HL,ENDMRK    ;GOTO END OF
                                        ;PRINT BUFFER
7AF0 36 80              4990            LD (HL),ENDING  ;SET END MARKER
7AF2 78                 5000            LD A,B          ;GET IDENTIFYING
                                        ;LETTER
7AF3 2B                 5010            DEC HL          ;POINT TO IDFLET
7AF4 CD 7A B0           5020            CALL IDNTF0
7AF7 30 01              5030            JR NC,NOZAR
7AF9 AF                 5040            XOR A
7AFA 77                 5050 NOZAR:     LD (HL),A       ;PUT ID THERE (IF IT
                                        ;WASN'T '0')
7AFB 06 00              5060            LD B,0          ;WE NEED NULLS
7AFD 2B                 5070            DEC HL          ;TO MOVE
7AFE 70                 5080            LD (HL),B       ;CLEAR LOCATION
7AFF EB                 5090            EX DE,HL        ;HL = RESULT, DE
                                        ;POINTS TO PRTBUF
7B00 CD 7A E3           5100            CALL ONGOTO     ;DEPENDING ON
                                        ;IDENTIFIER
7B03 18 1A              5110            JR COMON3       ;IDENTIFIER
7B05 18 1A              5120            JR COM
7B07 18 18              5130            JR COM
7B09 18 16              5140            JR COM
7B0B 18 3D              5150            JR PRTASC
7B0D 7D                 5160 PRTLOG:    LD A,L
7B0E B4                 5170            OR H
7B0F 28 0A              5180            JR Z,FALSE      ;HL = 0
7B11 3E FF              5190            LD A,OFFH
7B13 BD                 5200            CP L
7B14 C0                 5210            RET NZ          ;NOT -1, DON'T
7B15 BC                 5220            CP H            ;PRINT ANYTHING
7B16 C0                 5230            RET NZ          ;SAME
7B17 3E 54              5240            LD A,'T'        ;FFFFH = TRUE
7B19 12                 5250            LD (DE),A
7B1A C9                 5260            RET
7B1B 3E 46              5270 FALSE:     LD A,'F'
7B1D 12                 5280            LD (DE),A
7B1E C9                 5290            RET
7B1F 1B                 5300 COMON3:    DEC DE          ;COMMA AFTER 3
7B20 1B                 5310            DEC DE          ;DIGITS FOR DEC
7B21 CB 7C              5320 COM:       BIT 7,H         ;AFTER 4 DIGITS
                                        ;FOR ALL OTHERS
7B23 28 04              5330            JR Z,NOTNGN     ;NOT NEGATIVE #
7B25 AF                 5340            XOR A
7B26 32 7B 75           5350            LD (ENDMRK),A   ;CLEAR ENDMARK
                             ; - WILL PRINT '(-)' AS WELL
7B29 D5                 5360 NOTNGN:    PUSH DE
7B2A FD E1              5370            POP IY          ;POINT IY TO
                                        ;PRTBUF
7B2C EB                 5380            EX DE,HL        ;GET # IN DE
7B2D CD 7A 3C           5390 CONVRT:    CALL SDIVID     ;DIVIDE BY C (BASE)
7B30 7D                 5400            LD A,L          ;REMAINDER OF
                                        ;DIVISION
7B31 D6 0A              5410            SUB 10          ;ADJUST TO ASCII
7B33 38 02              5420            JR C,DIGOK
7B35 C6 07              5430            ADD A,7
7B37 C6 3A              5440 DIGOK:     ADD A,30H + 10
7B39 FD 77 00           5450            LD (IY),A       ;PUT DIGIT IN
7B3C 7B                 5460            LD A,E          ;BUFFER
7B3D B2                 5470            OR D
7B3E 28 06              5480            JR Z,PRTEND
7B40 FD 2B              5490            DEC IY          ;MOVE BACK IN
7B42 FD 2B              5500            DEC IY          ;BUFFER
7B44 18 E7              5510            JR CONVRT       ;AND CONTINUE
7B46 FD E5              5520 PRTEND:    PUSH IY         ;ADDRESS OF
7B48 D1                 5530            POP DE          ;MESS TO DE
7B49 C9                 5540            RET
7B4A 7C                 5550 PRTASC:    LD A,H
7B4B B7                 5560            OR A
7B4C C0                 5570            RET NZ          ;CAN'T BE ASCII
7B4D 7D                 5580            LD A,L
7B4E E6 7F              5590            AND 7FH         ;RESET HIGH BIT
7B50 FE 20              5600            CP SPACE
7B52 D8                 5610            RET C           ;CAN'T PRINT
                                        ;CONTROL CHARS
7B53 12                 5620            LD (DE),A       ;CHAR O.K.
7B54 C9                 5630            RET
                        5640 ; PRINT BUFFER
7B55 00 00 00 00        5650            DB 0,0,0,0,0,0,0,','
7B59 00 00 00 2C
7B5D 00 00 00 00        5660            DB 0,0,0,0,0,0,0,';'
7B61 00 00 00 3B
7B65 00 00 00 00        5670            DB 0,0,0,0,0,0,0,','
7B69 00 00 00 2C
7B6D 00 00 00 00        5680            DB 0,0,0,0,0,0,0
7B71 00 00 00
7B74 00                 5690 IDFLET:    DB 0
7B75 00 20 28 2D        5700 ENDMRK:    DB 0,'(-)',ENDING
7B79 29 80
                        5710
7B7B 4F 56 45 52        5720 OVFLMS:    DB 'OVERFLOW'
7B7F 46 4C 4F 57
7B83 20
7B84 45 52 52 4F        5730 ERRMSG:    DB 'ERROR',CR,'??'
7B88 52 0D 3F 3F
7B8C 20
                        5740 BUFFER:    END
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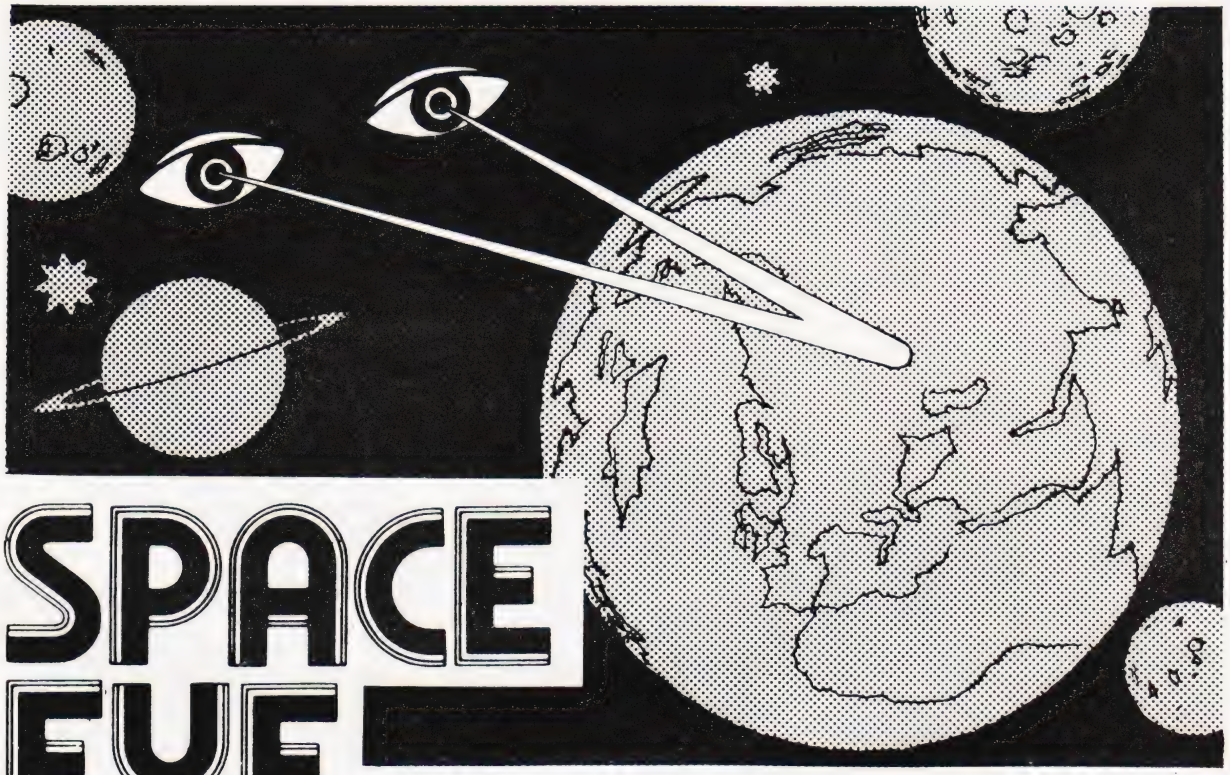

SPACE EYE

When you come to think of it, computer programs are rather like films, the viewer or operator normally takes the part of the good guy. In this game the roles are transposed. You take the part of a Vogon space commander and your mission is to destroy Earth, the Moon, Mars or Jupiter, before the surface defences shoot you down with their missiles. So far, apart from the roles being somewhat transposed, we have an ordinary space shooting game. The importance of this game is hinted at by its title — "Space Eye", for during the play of the game, that is to say during the attack on the planet, the centre of the screen is taken up by a fantastically realistic view of the planet underneath. Obviously the topography of Earth is better known to us than that of the other planets, so it is with the Earth attack that one gets the most realism. One almost gets the actual feeling of passing over the Earth as the Continents pass below the Space Eye. The impression is quite uncanny and really has to be seen to be appreciated. The graphics for the various planets are so extensive that they cannot be included in the program and are supplied in the form of datafiles which the program inputs. In other words, when you have chosen the planet which you wish to attack, the data for that particular planet is fed in from either tape or disk.

Here and there on the planet's surface are enemy bases which have to be destroyed. Intermingled with them are the enemy's rocket sites which will, with uncanny accuracy, damage your vessel with their missiles. Although this shooting back and forth is good fun, the value of the program as we have said, lays in the realism of the image of Earth passing beneath the Space Eye. As we are not so familiar with the other planets, the view passing beneath the Space Eye has been annotated with the names of the most important features and in the case of Jupiter and Mars, some of the Moons are displayed. During an attack the surface of the planet passes beneath the Space Eye as we have described, but an added feature is that the user has the option of displaying on the screen the planet over which he is orbiting. This can come in handy if you are not used to orbiting around Mars and Jupiter!

The program is available for disk minimum 32K sytems or tape with a minimum of 16K. It is compatible with Video Genies which have had the righthand arrow key fitted. Orders must stipulate tape or disk as the two versions are different.

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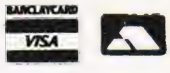

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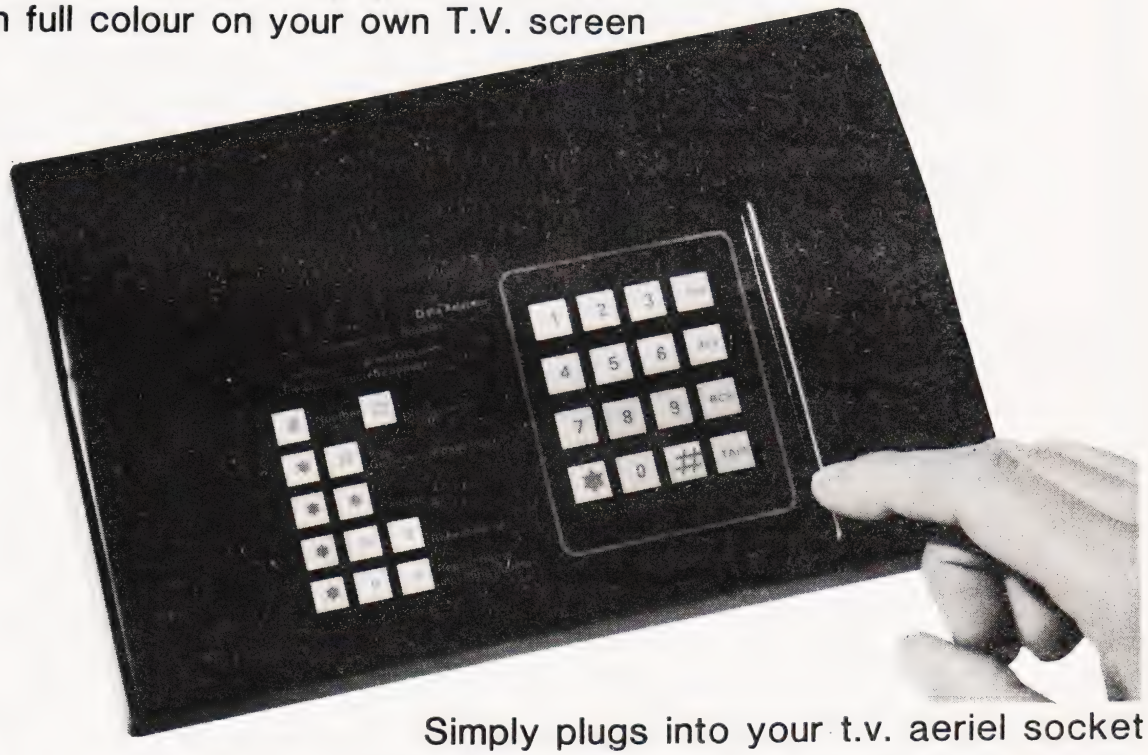

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Dear Sir,

Under the auspices of the National TRS-80 Users Group an Educational Group has been established.

Other TRS-80/Video Genie users are very welcome to join.

It is hoped to do the following:

1. Compile a directory of schools where the TRS-80 is in use.
2. Compile a list of teachers involved in the use of those machines and their interests.
3. Establish the kind of use that machines are being put to in schools and discover what software is available and being developed.
4. Set up some sort of software exchange or library so that all members of the group could share from others skills.

We are also in the process of compiling a Directory of Educational Software for Primary Schools for the TRS-80. This will detail both commercial and home produced material from the UK and the USA. We would like to hear from other users to establish what they are using in school, even if the material is only in the development stage.

A small group of people from the National Users group are also involved in the translation of software written for the Apple, RML3802 and PET to run on the TRS-80. Any help from members of MUSE would be welcome in this field.

Any schools or people interested in Education useage with TRS-80 do contact me as soon as possible.

D J Futcher,
Head Teacher,
Beaconsfield First and Middle School,
Beaconsfield Road,
Southall, Middlesex UB1 1DR.

Dear Sir,

Please notice for your information and your readers that the Leeds TRS-80 Users Group has been formed since January 1981 and meets at the White Swan, Yeadon, Nr Leeds, every 3rd Thursday in the month at 7.30pm, and at the moment has a membership of about 60.

Yours sincerely,
Evan Johns (Sec.)
Leeds.

Dear Mr Sinclair,

I have just read your review of the Acorn ATOM in the April 81 issue of Computing Today, and, as secretary of the ATOM User Group, feel that I must correct you on a few points.

The mechanism you outline by which the ATOM stores its BASIC programs is wrong. You are quite correct when you say that line numbers are stored most significant byte first; however, the most significant byte is NOT omitted if zero — otherwise how would you store a line number of 255 when 255 is an end of text mark? Each line is stored in ASCII with a carriage return at the end — however, there is no zero following it; merely the most significant byte of the next line number. (Line numbers are stored in binary rather than ASCII form). The end of program is marked by any negative byte (128 to 255). The following byte, which you gave as 164, is, in fact, meaningless unless it is used by an array or string.

While I agree completely with you that there would be considerable reductions in memory requirements by tokenising the BASIC command words, as well as an increase in speed of running. There are many advantages in the strategy the ATOM uses, namely:

1) As you say, it is very easy to modify a program from BASIC.
2) It is possible to use the BASIC line entry facility for entering things other than BASIC programs — for instance, text — while being guaranteed how the thing will be stored, so other programs can manipulate it (text editors, assemblers etc). In Microsoft type implementations, if this is tried BASIC will tokenise things it recognises and leaves things it doesn't in clear — which makes it difficult for anything else to use it.

In your table of BASIC commands, you say the FIN, PTR and SHUT commands are not available on the extended ATOM. They are. However, PTR and SHUT are irrelevant without a disc system.

While I agree that, at first, the string handling does seem a bit obscure, when you realise the mechanism by which the ATOM stores and manipulates strings, things become a little clearer.

Strings are stored in a very similar method to programs — as a string of characters terminated by a carriage return. The $ operator says to the interpreter "take the byte at the address following as a string" and the string so defined is manipulated. Anything that evaluates to an address can be used, subject to some minor restrictions, after a $ operator.

For instance:

$#8203 represents the string at location #8203 (the first line of a BASIC program in an unexpanded ATOM)

$A the string at location held in A. DIM A(100) for instance presets A with the address at which the string will be stored

$TOP stores the string in the first free byte of memory onwards after the program. Using this, the LEFT$ example, which is apparently obscure, is easily understood. What it does is replaces the string from (A+4) onwards with a null string — thus leaving $A as the first four characters of the original $A plus a null string! It could also be done by A?4=#D — ie by POKEing in an end-of-string chracter. While I appreciate that others may differ, I personally like the freedom which the ATOM's use of string commands and ? operator gives.

Incidentally, arrays of strings may be generated by

```
DIM AA(20)
FOR N=0 TO 20
DIM A(100)
AA (N) = A
NEXT N
```

gives an array of strings $AA(0) to $AA(20).

If you know what you are doing, you do not have to dimension strings provided you allocate storage yourself. You can, for instance, use

```
A = #/ 9000 ; IN. $A
```

which will input a string to locations 9000 upwards.

I do not agree with you when you describe jumping out of a FOR. . . NEXT loop before it terminates as messy programming. It is frequently necessary, just as is jumping out of a DO. . . UNTIL or WHILE loop — or any other type of iterative loop — especially when doing jobs like searching arrays to avoid inefficiency. It does tend to be a limitation with interpreters that they get upset if you try it — however there are (usually messy) methods of overcoming this shortcoming, which is less obvious in truly compiled languages.

Lastly, in my experience, the ATOM BASIC is very powerful when you consider it in the context of other 4K integer BASICs and many of the limitations and peculiarites do stem from this. It is perhaps a little unfair to compare the integer 4K BASIC in the ATOM — the other 4K houses the assembler and cassette system — with the 8K Microsoft BASICs that it does inevitably get compared with.

Yours sincerely,
Richard Meredith
Sec., Atom User Group
S Devon.

Dear Sir,

Following D S Mear's letter in the Nov. issue on rounding in BASIC, a slightly improved method which rounds negative numbers is;

```
DEF FNX(R)=SGN(X)*INT(ABS(X)/R+0.5)
*R
```

Here, X is the number to be rounded, and R is the rounding parameter (=.1 for one decimal place, .01 for two, 25 for the nearest 25 etc).

To round a number A to n decimal places write

```
X=A:A=FNX(1E-n)
```

Yours faithfully,
R A MacLean
Cardiff.

Dear Sirs,

S Draper's 'Bit Manipulation' program in your April issue is unnecessarily cumbersome, presumably because the author hasn't appreciated the power of the logic operators in BASIC.

It is often wrongly assumed that these may only be used in IF. . . THEN conditions; not so! They function in exactly the same way as ANDs and ORs in machine code.

Thus assuming BIT holds the number of the bit to be modified (0-7), a simpler and much faster program would be: (** is exponentiation)

To set BIT in BYTE —

```
100 MASK=2**BIT : BYTE=BYTE OR
MASK
```

To reset BIT in BYTE —

```
110 MASK=256-2**BIT : BYTE=BYTE AND
    MASK
```

This is exactly the sort of thing that the logic operators are useful for, but few BASIC manuals ever admit that they can work like this, though they do on most computers. I hope this will be of some use to your readers.

Yours,
Stephen Burt
Dorset.

Dear Sirs,

May I, through your magazine, announce to the world that Doncaster now has its very own micro users group. The Doncaster Amateur Computer Society (DACS — not to be confused with DAS which is something entirely different) meets on the 1st Wednesday of each month at the YMCA, Wood Street, Doncaster. There is a £1.00 entrance fee and subscriptions are £5.00 per year for persons aged 18 and over and £2.50 per year for persons under 18. Further information may be obtained from myself at the address below or by contacting Mr John Wilkinson on Doncaster 868379.

Yours faithfully,
M P Flinders
S. Yorkshire.

Dear Sirs,

With reference to Mr Phil Green's "three line wonder" featured in PRINTOUT June 1981, I would like to point out that this uses an "illegal" call to the monitor, resulting in this routine being incompatible with NAS SYS 3. The program should read as follows:-

```
10 DOKE 3100,2048:DOKE2049,1578:DOKE
   2050,-8440
20 DOKE 2052-13978:INPUT
   "Decimal";A:DOKE 2054,A
30 A=USR(A):PRINT "Hex":GOTO 10
```

Yours,
Stephen W Parrish
Buckinghamshire.

Dear Sir,

I am a new reader to your magazine, and also a newcomer to home computing, I own a ZX80.

Re your Softspot program for ZX80 Drawing Board, as written, it did not work!! After hours of fun, I discovered a bug on line 40, it should be,

```
PRINT CHR$(0)
```

Thought it might be of help to others.
Yours faithfully,
A W Boyles
S. Glam.

Dear Sir,

With reference to the 'Space Invasion' software published in the Dec. 1980 issue of 'Computing Today'.

I own a Microtan 65 with Tanex and have the software stored in EPROM which I then copy into the correct memory location using Tanbug.

The programme is excellent with one exception. When all the Invaders have been destroyed for the 10th time, 57 aliens reappear and the legend 'Invasion Complete' appears (It appears that the base line has been touched). I understand that the Invaders should reappear at a greater height at this stage of the game.

I have checked my software listing a number of times and can find no discrepancy.

I would be grateful if you would confirm the following:-

1) that the game should not end in the manner described.
2) that there is not a bug in the listing printed (I have the modification to prevent an alien partially disappearing and then reappearing).

I hope that you will be able to assist me with this problem.

Many thanks for an exceptional magazine.

Yours faithfully,
B Wragg
Hants.

(* When we published the listing for the game we did say that the RAM based version, which you have, is slightly different to the ROM based version. The endgame for the RAM version is exactly as you have described it, there are no bugs. It is possible to modify the game by preventing the new starting position of the invaders from getting too far down the screen but you'll have to reload your program into EPROM again. Ed*)

Dear Sir,

I was most interested to read Mr. Wellsman's review of the Video Genie, which highlighted many of the machine's less obvious features in a most pertinent manner. I own one of the early models and opted to carry out each of the hardware updates myself rather than through a dealer (keyboard, sound, display mods.). Here are a few additional comments on the basis of that experience.

The case of the machine is in fact made of plastic and not metal, although the power supply is in its own internal metal case (as on an Apple).

I suspect the STOP and RESET faults are linked, even though the appropriate buttons are at opposite ends of the case! When supplied my VG refused to shine its power lamp, although it worked perfectly otherwise. The substantial jolt given by the computer's STOP key sometimes used to flash it, and I discovered that I could make it glow at two different intensities by 'stroking' it in different directions! Normally it wouldn't shine at all without this special treatment. The fault was a poorly soldered joint on the keyboard PCB, and as the RESET switch is also hand-fitted I suspect there is a similar fault on the processor board of your review machine. This may be an Oriental quality-control problem, and dealers seem quite happy to sort it out in the UK. The chips are all machine-fitted and seem well assembled by comparison.

The problem with the 'concave' display is also easily cured — most production VG's seem to produce a display in the bottom left-hand corner. This gives graphics displays an untidy 'rounded shoulder' on the top right edge. To centralise the display you can adjust the video timing by means of the two preset resistors at the bottom right corner of the middle circuit board. They move the frame around the screen — use

```
10 FOR A=15360 TO 16383 : POKE A,191 :
   NEXT : GOTO 10
```

to generate a test pattern on the whole screen. Dealers will do this for you if you wish — if not, remember to use a plastic trimming tool to make the adjustments as a screwdriver will disturb the circuit due to its capacitance.

Yours,
Simon Goodwin
Hereford.

Dear Editor,

I cannot let your reviewer's comment (Video Genie review May issue) on cassette problems and the TRS-80 pass without comment. The recent changes to the TRS-80 seem to have cured all the problems that have been associated with the machine. I have no problems with keybounce, video-wobble, or cassette saving and loading, so let me assure anyone who is contemplating the purchase of a TRS-80 that they need not worry on that score.

I consider that the Tandy is an excellent machine, with a very powerful BASIC interpreter, and has the advantage of being upgradable in fairly painless stages (you can, for example, buy a disc drive for well under £200). There are also a very wide range of software and hardware accessories available, and competition usually means keener prices.

I have no connection with Tandy, except that I am starting the Merseyside TRS-80 and Video Genie users group. (For further details anyone interested is invited to contact me on 051-220 9733).

Yours faithfully,
Peter R Tootill
Liverpool.

Dear Sir,

Integer Arithmetic on PETs.

I had always assumed that integer arithmetic would have the following advantages:-

1) A gain in storage space. It only needs two bytes to store an integer compared with five bytes for a floating point number.
2) An increase in speed, integer arithmetic being simpler for the processor to handle.

Both of these are FALSE on the PET. Integer and floating point numbers both take seven bytes including the variable name. The second point can be tested with the following two programs:-

```
10 Z = 1000
20 X = X + 1
30 Y = X * X/(X * X)
40 IF X <Z GOTO 20
```

Time 15 seconds

```
10 Z% = 1000
20 X% = X% + 1
30 Y% = X% *X%/(X% *X%)
40 IF X% <Z% GOTO 20
```

Time 18 seconds

This shows that integer arithmetic is 20% SLOWER than floating point arithmetic. Could it be that integer arithmetic is performed by converting to floating point, rounding off and converting back?

I can see so little value in the facility to use integer variables under these conditions I wonder why they bother to incorporate it.

Yours faithfully,
Leslie J Want Bsc. (Hons)
Derby.

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APPLE SKEET

Alan Unwin

Get around the Apple's graphic oddities and have fun at the same time

With all its manifold virtues, the Apple computer has one characteristic which its owners must have found frustrating when trying to follow Computing Today's recent series on computer graphics. Apple's screen map, instead of being numbered progressively from top to bottom, is numbered in discrete blocks of eight lines each. Adding 40 (the line length) to a given screen POKE value, therefore, has the surprising effect of jumping not to the next line, but to eight lines below. Here is a program which deals with this peculiarity and retains the advantage of speed that POKEing should give.

The skeet program shown here was written for the Apple II Plus. The field is set up with three 'guns' in lines 40 to 160. Lines 220 to 270 move the skeet to the right and detect keyboard input; lines 280 to 340 do the same for the return pass. Lines 440 to 520 move the 'bullet' (and cope with the Apple's screen mapping in the process) and line 430 detects a hit. No attempt has been made to offer a choice of speed or skeet size, but once the program is understood this will not be difficult. With a little ingenuity it could be made into a competitive game for two.

Program Listing

```
30    REM**SET UP FIELD AND GUNS
40    HOME:GR:COLOR=2
50    FOR Y=0 TO 39
60    FOR X=0 TO 39
70    PLOT X,Y
80    NEXT X
90    NEXT Y
100   A=0:B=0:D=-16384:F=1152:EF=F-1:FG=F+1
110   T=1360:TT=T:AA=0
120   POKE 1498,0:POKE 1497,2:POKE 1499,2
130   POKE 1508,0:POKE 1507,2:POKE 1509,2
140   POKE 1518,0:POKE 1517,2:POKE 1519,2
150   HTAB 11:VTAB 21:PRINT"1[8 SPC]2[8 SPC]3"
160   VTAB 23:HTAB18:PRINT"PRESS NUMBER TO SHOOT!"
170   GOTO 230
180   POKE-16368,0
190   IF L=1 THEN L=0:GOTO 270
200   IF L=2 THEN L=0:GOTO 290
210   REM**MOVE SKEET
220   IF L=2 THEN L=1
230   POKE F+B,242:POKE EF+B,34
240   IF B=39 THEN 280
250   IF L=1 THEN 430
260   IF PEEK (D)>127 THEN L=1:GOTO 360
270   B=B+1:GOTO 230
280   IF L=1 THEN L=2
290   B=B-1
300   POKE F+B,242:POKE FG+B,34
310   IF B=0 THEN 220
320   IF L=2 THEN 430
330   IF PEEK (D)>127 THEN L=2:GOTO 360
340   GOTO 290
350   REM**WHICH GUN?
360   IF PEEK (D)=177 THEN G=10:GOTO 400
370   IF PEEK (D)=178 THEN G=20:GOTO 400
380   IF PEEK (D)=178 THEN G=30:GOTO 400
390   GOTO 180
400   POKE-16368,0:AA=AA+1
410   VTAB 23:PRINT"SHOTS=";AA
420   REM**SHOOTING SEQUENCE
430   IF PEEK (T+G)=242 THEN 530
440   POKE TT+G,34:POKE T+G,2:TT=T
450   IF T=1024 THEN POKE T+G,34:T=1360: TT=T: GOTO 190
460   IF T=1104 THEN 490
470   IF T=1064 THEN 500
480   T=T-128:GOTO 510
490   T=1960:GOTO 510
500   T=1920
510   IF L=1 THEN 270
520   GOTO 290
530   POKE TT+G,34:A=A+1:VTAB 22:PRINT"SCORE=";A
540   FOR I=1 TO 100
550   N=PEEK (-16336)
560   NEXT
570   FOR PAUSE=1 TO 2000:NEXT
580   T=1360:TT=T:GOTO 190
```

Computing Today
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AGENTS THROUGHOUT THE UK AND OVERSEAS

BUYER'S GUIDE

Our quarterly guide to visual display units is joined by an introductory text.

The subject of this month's Guide is Visual Display Units, VDUs to the initiated. The main reason for including them in our regular surveys of the market is because more and more of the serious computers are offering multi-user capability or are moving away from the use of domestic TVs as the display mechanism. VDUs can be simply categorised into two groups, dumb and intelligent. A dumb terminal only contains the necessary electronics to take the information sent by the computer and display it on the screen, it is effectively a 'glass teletype'. An intelligent terminal, as the name suggests, contains a microprocessor and allows the user to do much more to the information on the screen *before* it is sent to the host computer. Many of the listed units offer the facility of emulation. This means that the unit can be programmed by the user to act as though it is one of a number of standard types of unit, VT52 and VT100 being typical 'standards'.

Many of the units contain more than one 'screenful' of memory allowing several 'pages' of a document to be created and edited locally before being sent to the computer for storage or processing. These facilities allow the computer to spend less time looking after the communications side and more time actually computing.

The Featured Features

In common with our two other Guides the model type, **Manufacturer** or **Distributor** and the relevant address are given for each of the product ranges. The next piece of information is the **Screen size** which is typically 12" or 15" measured diagonally across the screen. The larger the screen the less tightly packed the information displayed.

The **Char size** uses the same format as that in the Printer Guide. Sizes are expressed as the number of dots used to create each character, as with printers a 5 x 7 matrix will not produce true descenders but it is fair to note that most of the units available do produce true descenders.

Our next entry is **Lines x Cols** which indicates the screen format of the VDU. In general a 24 x 80 format is the most common but others do exist. Many of the intelligent terminals have a '25th line' which displays the current status of the device.

Confusion reigns with the **CA** entry! It actually stands for Cursor Addressing and if the entry beside it is 'Yes' it implies that, by a variety of methods, you can move the cursor to any given position on the screen — rather like POKE in BASIC but even more powerful. Uses of this technique are many and varied but one example is where the computer produces a form on the screen and, as you fill it in, moves the cursor to the next relevant position.

The **Colour** entry has very little to do with the aesthetics of the unit, it actually refers to the colour of the screen. Green has been shown to be an easy to use colour and amber is also gaining rapidly in popularity. Traditional white on black is still dominant — it's cheaper.

If the character set of the unit contains any **Sp. Char** these are generally simple line and form drawing graphics. Specialised graphics characters are sometimes available and the **Other fonts** entry will reveal this together with the existence of other character sets; foreign languages for example.

It is extremely useful to have separate sets of keys for the cursor and numeric functions and the information about these facilities is given in the **No of keys**, **Numeric pad** and **Cursor keys** entries.

Interfaces with the VDU are found in the **Interface** entry with the speed of operation given, if appropriate, at the **Baud rate** entry. Some VDUs are equipped with a second interface to which a printer can be attached for direct copying of the screen contents. If the VDU has one there will be an entry against **Printer port**. Similarly some VDUs allow for the connection of a **Light pen**, a device that seems to be returning to favour.

The **Price**, **Options** and **Notes** entries give the rest of the vital information that you might need.

Variations

One or two letters have been received concerning VDUs which don't appear to get a mention in the Guide. Several UK distributors handle the same product but under their own 'house brand' and, in all the cases we know of, the original importer's product *is* listed. If there are any omissions please let us know full details, preferably in the form that we print them, and we'll do our best to get them in next time.

ADDS

Regent Range
Dist. Brospa Data Ltd.,
87 Castle Street,
Reading, RG1 7ST
0734-589393

Screen size:- 12"
Char. size:- —
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- Yes
No. of keys:- 77
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- V24,20mA
Baud rates:- 110-9,600
Printer port:- Yes
Light pen:- No
Other fonts:- Wide range available by switch
Price:- £560 (for Regent 25)

Notes:- From Dumb @ £560 (Regent 25) to Smart @ £890 (Regent 60). Graphics (H.P.4010 Emulator)/Option available on all Models.

AMPEX

Dialogue 80
Dist. Brospa Data Ltd.,
87 Castle Street,
Reading RG1 7ST.
0734-589393.
Also from Geveke Electronics

Screen size:- 12"
Char. size:- —
Lines x Cols:- 25 x 80
CA:- Yes
Colour:- No
Sp. Char.:- Yes
No. of keys:- 96
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- V24,20mA
Baud rates:- 50-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- No
Price:- £775

Options:- Key Lock Switch, 3 and 4 Pages of screen memory, 4K of key memory.
Notes:- 2 Pages of Memory as standard. Comprehensive edit, Transmission & Display facilities.

ANDERSON JACOBSON

AJ 510
Manuf. Anderson Jacobson Ltd.,
752 Deal Avenue, Slough,
Berkshire SL1 4SJ
0753-25172
+ Manchester office

Screen size:- 15"
Char. size:- 7 x 10
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- 41
No. of keys:- 94
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS232
Baud rates:- 110-9,600
Printer port:- Yes
Light pen:- No
Other fonts:- APL
Price:- £1,195

Options:- Full APL keyboard and character set, Overstrike.
Notes:- High quality VDU with APL capability and local printer port. Main appeal as remote terminal.

ANN ARBOR

Ambassador
Dist. IAL Digital Systems,
Midland House, Dugal Drummond Street,
Portsmouth PO1 2BE
0705-751621

Screen size:- 15"
Char. size:- Variable
Lines x Cols:- 18-60 x 80
CA:- —
Colour:- Green
Sp. Char.:- —
No. of keys:- 94
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS232
Baud rates:- 110-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- Yes
Price:- £975

Options:- Extra screen memory.
Notes:- 12 programmable function keys, keyboard selectable baud rates, detached keyboard.

BURNT HILL ELECTRONICS

BH 711
Manuf. Burnt Hill Electronics
19 Holder Road, Aldershot,
Hampshire GH12 4RH
0252-313701

Screen size:- 12"
Char. size:- 7 x 5
Lines x Cols:- 16 x 64
CA:- —
Colour:- Green
Sp. Char.:- —
No. of keys:- N/A
Numeric pad:- N/A
Cursor keys:- N/A
Interface:- CCITT V24,20mA
Baud rates:- 75-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- No
Price:- £656

Options:- Control and keyboard function re-assignment.
Notes:- Rack mounting VDU for use with remote keyboards such as the BH 722 @ £204 or the BH 723 @ £173.

BH 720

Screen size:- 12"
Char. size:- 5 x 9
Lines x Cols:- 25 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- Yes
No. of keys:- 75
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- CCITT V24, 20mA
Baud rates:- 75-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £892

Options:- Control and keyboard function re-assignment.
Notes:- Free standing terminal with a number of pre-defined control functions built in.

BH 721

Screen size:- 12"
Char. size:- 5 x 9
Lines x Cols:- 25 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- Yes
No. of keys:- N/A
Numeric pad:- N/A
Cursor keys:- N/A
Interface:- CCITT V24, 20mA
Baud rates:- 75-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £862

Notes:- Rack mount display terminal for use with remote keyboards such as the BH 722 or the BH 723.

BH 912

Screen size:- 12"
Char. size:- 7 x 10
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 84
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232, 20mA
Baud rates:- 75-19,200
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £695

Notes:- Micro controlled intelligent editing terminal.

BH 920

Screen size:- 12"
Char. size:- 7 x 10
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 103
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232, 20mA
Baud rates:- 75-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £895

Notes:- Extended version of the BH 912 with a two page display memory.

CIFER SYSTEMS

MODEL 2602
Manuf. Cifer Systems Limited
Avro Way, Bowerhill,
Melksham, Wiltshire SN12 6TP
0225-704502

Screen size:- 12"
Char. size:- 7 x 11
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green optional
Sp. Char.:- Optional
No. of keys:- 62
Numeric pad:- No
Cursor keys:- Yes
Interface:- CCITT V24
Baud rates:- 50-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £728

Options:- Extra page memory, 20mA current loop interface.
Notes:- Versatile medium priced VDU.

MODEL 2603

Screen size:- 12"
Char. size:- 7 x 11
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green optional
Sp. Char.:- Optional
No. of keys:- 62
Numeric pad:- No
Cursor keys:- Yes
Interface:- CCITT V24
Baud rates:- 50-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £745

Options:- As Model 2602.
Notes:- Extended version of 2602 with visual highlighting and double size and flashing character capability.

MODEL 2604

Screen size:- 12"
Char. size:- 7 x 11
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green optional
Sp. Char.:- Yes
No. of keys:- 62
Numeric pad:- No
Cursor keys:- Yes
Interface:- CCITT V24
Baud rates:- 50-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £762

Options:- As Model 2602.
Notes:- Extended version of the 2603 with overstrike graphics giving line drawing facilities.

MODEL 2605

Screen size:- 12"
Char. size:- 7 x 11
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green optional
Sp. Char.:- Optional
No. of keys:- 102
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- CCITT V24
Baud rates:- 50-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £829-862

Options:- Extra screen memory, 20mA current loop interface.
Notes:- Full feature editing terminal with 25th status line display and a variety of display options.

MODEL 2632

Screen size:- 12"
Char. size:- 7 x 11
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green optional
Sp. Char.:- Optional
No. of keys:- 100
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- CCITT V24
Baud rates:- 50-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £997

Notes:- Semi intelligent on or off-line editing terminal with a wide selection of pre-programmed functions.

MODEL 2652

Screen size:- 12"
Char. size:- 7 x 11
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green optional
Sp. Char.:- Optional
No. of keys:- 100
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- CCITT V24
Baud rates:- 50-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £963

Notes:- Fully DEC VT52 compatible unit with several extra features taken from the 2605.

DACOLL

MODEL 242-3
Manuf. Dacoll Engineering Services
Dacoll House, Gardners Lane,
Bathgate, West Lothian, Scotland.
0506-56565

Screen size:- 12"
Char. size:- 8 x 7
Lines x Cols:- 25 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- —
No. of keys:- 82
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- CCITT V24, 20mA
Baud rates:- 110-9600
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £600

Options:- 132 columns. Second page memory, Full editing.
Notes:- Versatile unit capable of being configured for a number of systems such ast VT52 or VIP 7250.

MODEL 246

Screen size:- 12"
Char. size:- 8 x 7
Lines x Cols:- 25 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- —
No. of keys:- 94
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- Special
Baud rates:- —
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £1,100

Notes:- A slave VDU designed to operate with the 245 controller which allows up to 8 units to emulate a specified protocol.

DIRECT

Direct VP800B
Dist. Sintrom Electronics
14 Arkwright Road, Reading,
Berks RG2 0LS
0734-84322

Screen size:-12"
Char. size:- 5x7 or 7x9
Lines x Cols:- 24 x 80 or 28 x 132
CA:- Yes
Colour:- Green optional
Sp. Char..- Programmable
No. of keys:- 128
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS232
Baud rates:- 150-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- Yes
Price:- £1,800

Options:- WP capability soon.
Notes:- Memory up to 34 pages of text, fully software controlled, detached keyboard.

ELBIT

DS 1920
Manuf. Elbit Data Systems
295 Aberdeen Avenue,
Slough, Berks. SL1 4HQ
Slough 26713

Screen size:- 12" or 15"
Char. size:- 5 x 8
Lines x Cols:- 24 x 80
CA:- —
Colour:- —
Sp. Char.:- —
No. of keys:- 63 or 95
Numeric pad:- —
Cursor keys:- —
Interface:- CCITT V24
Baud rates:- 110-9600
Printer port:- —
Light pen:- —
Other fonts:- —
Price:- £ — unknown

Options:- 20mA current loop interface, 7 x 8 character matrix.
Notes:- Basic glass teletype with some editing functions and a detachable keyboard.

DS 2000

Screen size:- 15"
Char. size:- 8 x 10
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green optional
Sp. Char.:- —
No. of keys:- N/A
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS232
Baud rates:- 75-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- APL
Price:- £850-900

Options:- Amber screen, APL set and keyboard.
Notes:- 48 line display memory with 1 page scrolling window or 2 pages Micro controlled terminal.

DS 376

Screen size:- 15"
Char. size:- 9 x 7
Lines x Cols:- 24 x 80
CA:- —
Colour:- Green optional
Sp. Char.:- —
No. of keys:- N/A
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- —
Baud rates:- —
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- —

Options:- Amber screen.
Notes:- Cluster terminal controller.

GENERAL TERMINAL CORP

SW10
Dist. SEN Electronics
5 London Street, Chertsey,
Surrey KT16 8AP
09328-66744

Screen size:- 12"
Char. size:- 5 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- Yes
No. of keys:- 84
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS232
Baud rates:- 50-9600
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £600

Options:- Detachable keyboard.
Notes:- Intelligent user programmed terminal capable of VT100, VT52, ADMS-A emulation.

HAZELTINE

MODEL 1410
Manuf. Hazeltine Ltd.,
292 Worton Road, Isleworth,
Middlesex TW7 6EL
01-568 1851

Screen size:- 12"
Char. size:- 5 x 7
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 65
Numeric pad:- Yes
Cursor keys:- No
Interface:- RS 232
Baud rates:- 110-9600
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £475

Notes:- Bottom of the range, no frills VDU, ideally suited to the remote user or micro owner.

MODEL 1420

Screen size:- 12"
Char. size:- 5 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 77
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 110-9600
Printer port:- —
Light pen:- No
Other fonts:- Optional
Price:- £515

Options:- 20mA current loop interface, Aux I/O port.
Notes:- Terminal aimed specifically at the small business and word processing end of the market. Character set has true descenders.

MODEL 1421

Screen size:- 12"
Char. size:- 5 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 73
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 110-9600
Printer port:- No
Light pen:- No
Other fonts:- Optional
Price:- £515

Options:- 20mA current loop interface, Aux I/O port.
Notes:- Lear Siegler ADM 3A compatible version of the 1420.

MODEL 1500

Screen size:- 12"
Char. size:- 7 x 10
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 74
Numeric pad:- Yes
Cursor keys:- No
Interface:- RS 232, 20mA
Baud rates:- 110-19,200
Printer port:- No
Light pen:- No
Other fonts:- Optional
Price:- £785

Notes:- Unit supplied with an auxiliary port that could be used for a printer and also permits remote editing of screen data.

MODEL 1510

Screen size:- 12"
Char. size:- 7 x 10
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 81
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232, 20mA
Baud rates:- 110-19,200
Printer port:- No
Light pen:- No
Other fonts:- Optional
Price:- £880

Notes:- Screen format mode, Memory protect, Reverse video selectable and remote editing capability.

MODEL 1520

Screen size:- 12"
Char. size:- 7 x 10
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 81
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232, 20mA
Baud rates:- 110-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £1,050

Notes:- Full microprocessor controlled, buffered data entry terminal with integral local printer interface

MODEL 1552

Screen size:- 12"
Char. size:- 7 x 10
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- Yes
No. of keys:- 81
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232, 20mA
Baud rates:- 110-9600
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £800

Notes:- DEC VT52 compatible terminal with several extra features.

EXECUTIVE 80-20/30

Screen size:- 15"
Char. size:- 7 x 10
Lines x Cols:- 25 x 80 or 132
CA:- Yes
Colour:- Green
Sp. Char.:- —
No. of keys:- 108
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232/449, 20mA
Baud rates:- 110-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- From £857

Options:- Buffered printer port, 20mA interface.
Notes:- Ergonomically designed VDU with audio or tactile feedback, smooth scrolling, 2 page screen memory, separate keyboard etc.

IBM (UK) LTD.

3101
Manuf. IBM (UK) Ltd.,
PO Box 41, North Harbour,
Portsmouth, Hampshire PO6 3AU
0705-694941

Screen size:- 12"
Char. size:- 7 x 14
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- —
No. of keys:- 87
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232/422, 20mA
Baud rates:- to 9600
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £ — TBA

Options:- A wide variety of interface options, 3102 printer.
Notes:- Very high quality ergonomically designed VDU made up of three discrete units with matching printer.

LEAR SIEGLER

ADM-3A
Dist. Penny and Giles Ltd.,
Computer Peripherals Division,
Mudeford, Christchurch,
Dorset BH23 4AT
04252-71511
UK importer, many other local outlets.

Screen size:- 12"
Char. size:- 5 x 7
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Optional green
Sp. Char.:- —
No. of keys:- 59
Numeric pad:- No
Cursor keys:- No
Interface:- RS 232, 20mA
Baud rates:- 75-19,200
Printer port:- No
Light pen:- No
Other fonts:- Optional
Price:- £492

Options:- Remote numeric data entry pad, Auto repeat, Lower case.
Notes:- Basic VDU with standard upper case only.

ADM-3A +

Screen size:- 12"
Char. size:- 5 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Optional green
Sp. Char.:- —
No. of keys:- 73
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232, 20mA
Baud rates:- 75-19,200
Printer port:- No
Light pen:- No
Other fonts:- Optional
Price:- £552

Options:- Auto repeat.
Notes:- De-luxe version of the ADM-3A with true lower case and integral keypad.

ADM-31

Screen size:- 12"
Char. size:- 7 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Optional green
Sp. Char.:- Optional
No. of keys:- 90
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232, 20mA
Baud rates:- 50-9600
Printer port:- Yes
Light pen:- No
Other fonts:- Various
Price:- £737

Options:- Direct polling of cursor position.

Notes:- Two page memory device with micro control, full editing capability and programme personality.

ADM-42

Screen size:- 15"
Char. size:- 7 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Optional green
Sp. Char.:- Optional
No. of keys:- 118
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232, 20mA
Baud rates:- 50-9600
Printer port:- No
Light pen:- No
Other fonts:- Optional
Price:- £1,170

Options:- 8 page memory, Printer port, Bus interface, etc.
Notes:- Three part VDU with virtually every option possible, lives up to the name of American Dream Machine, hence the initials!

LYME

MODEL 4002
Manuf. James Scott Electronic Developments
2 Avenue Court, Farm Avenue,
London NW2
01-452 0490

Screen size:- 12"
Char. size:- 12 x 7
Lines x Cols:- 24 x 80
CA:- —
Colour:- Green
Sp. Char.:- —
No. of keys:- 90
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 75-9600
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £625

Options:- See Models 4003-4006.
Notes:- Two page memory terminal with integral programmable functions.

MODEL 4003

Screen size:- 12"
Char. size:- 12 x 7
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- —
No. of keys:- 90
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 75-9600
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £625

Options:- See other models in range.
Notes:- Enhanced version of 4002 with extra status line display and DEC VT52 compatability.

MODEL 4004

Screen size:- 12"
Char. size:- 12 x 7
Lines x Cols:- 24 x 80
CA:- —
Colour:- Green
Sp. Char.:- —
No. of keys:- 90
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 75-9600
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £625

Options:- See other models in range.
Notes:- Teletype or two page editing terminal configuration with block and line transmission capability.

MODEL 4005

Screen size:- 12"
Char. size:- 12 x 7
Lines x Cols:- 24 x 80
CA:- —
Colour:- Green
Sp. Char.:- —
No. of keys:- 90
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 75-9600
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £625

Options:- See other models in range.
Notes:- Data General 6053 compatible version of the 4003.

MODEL 4006

Screen size:- 12"
Char. size:- 12 x 7
Lines x Cols:- 24 x 80
CA:- —
Colour:- Green
Sp. Char.:- —
No. of keys:- 90
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 75-9600
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £625

Options:- See other models in the range.
Notes:- Hazeltine 1410 compatible version of the 4003.

MODEL 5000
Manuf. Gresham Lion,
Gresham House, Twickenham Road,
Feltham, Middx. TW13 6HA
01-894 5511

Screen size:- 15"
Char. size:- 12 x 7
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- Yes
No. of keys:- 102
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS232,20mA
Baud rates:- 75-9,600
Printer port:- Yes
Light pen:- No
Other fonts:- Yes
Price:- £745

Options:- 132 column screen, synchronous interface.
Notes:- Fully user programmable VDU with a choice of terminal emulations.

LYNWOOD

BETA
Manuf. Lynwood Scientific Developments Ltd.,
Caker Stream Road,
Alton, Hampshire.

Screen size:- —
Char. size:- 7 x 11
Lines x Cols:- 30 x 80
CA:- —
Colour:- Green
Sp. Char.:- —
No. of keys:- Choice
Numeric pad:- Optional
Cursor keys:- Optional
Interface:- V24, 20mA
Baud rates:- 50-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £—

Options:- Choice of keyboards.
Notes:- Microprocessor controlled terminal with page memory. Slightly less sophisticated version of the ALPHA graphics terminal.

MICRO TERM

ACT-V
Dist. Strumech
Portland House, Coppice Side,
Brownhills, West Midlands.
05433-4321

Screen size:- 12"
Char. size:- —
Lines x Cols:- 24 x 80
CA:- —
Colour:- —
Sp. Char.:- Yes
No. of keys:- 77
Numeric pad:- —
Cursor keys:- —
Interface:- RS 232
Baud rates:- 110-9600
Printer port:- —
Light pen:- —
Other fonts:- —
Price:- £ — unknown

Notes:- Screen display can be re-configured to 48 x 39.

NEWBURY LABORATORIES

MODEL 7000
Manuf. Newbury Laboratories
King Street, Odiham,
Hampshire RG25 1NN
025-671 2910
6 Regional sales & service centres.

Screen size:- 12"
Char. size:- 7 x 5
Lines x Cols:- 24 x 80
CA:- —
Colour:- Green
Sp. Char.:- —
No. of keys:- 63
Numeric pad:- No
Cursor keys:- No
Interface:- CCITT V24,20mA
Baud rates:- 50-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £495

Options:- Model 7001 with addressable cursor and page mode @ £595.
Notes:- Microprocessor based "Glass Teletype" with 3 page memory.

MODEL 7002

Screen size:- 12"
Char. size:- 7 x 5
Lines x Cols:- 24 x 80
CA:- —
Colour:- Green
Sp. Char.:- —
No. of keys:- 74
Numeric pad:- Yes
Cursor keys:- No
Interface:- CCITT V24,20mA
Baud rates:- 50-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £545

Options:- Model 7003 with addressable cursor and page mode @ £645.
Notes:- More sophisticated version of the 7000 with several extras like video output and numeric keypad. 3 page memory as standard.

MODEL 7007

Screen size:- 12"
Char. size:- 6 x 8
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- —
No. of keys:- 91
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- CCITT V24,20mA
Baud rates:- 50-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £745

Options:- 25th display line, Field protect, Extra page memory.
Notes:- Full editing terminal with numerous features.

MODEL 7009

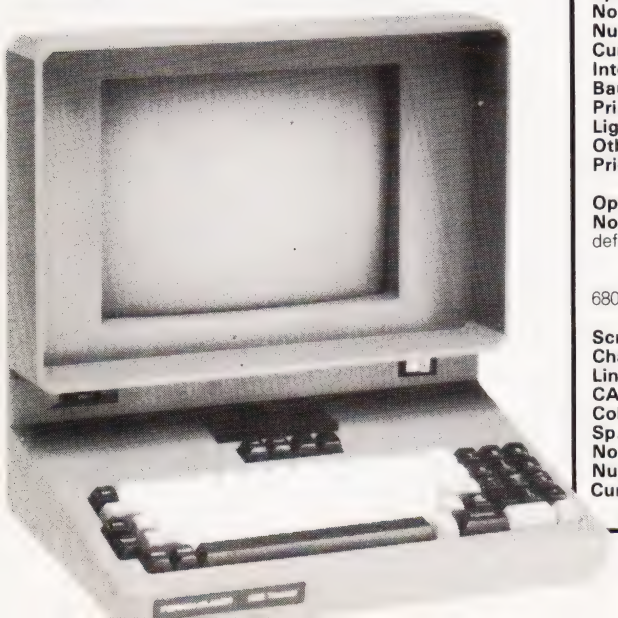
Screen size:- 12"
Char. size:- 7 x 8
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- —
No. of keys:- 91
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS232C,20mA
Baud rates:- 50-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £795

Options:- Displayable 25th line.
Notes:- Seven page memory VDU with full screen formatting capability through keyboard and protected memory.

PENNY & GILES

TERMINAL ONE
Manuf. Penny & Giles,
Mudeford, Christchurch,
Dorset BH23 4AT
04252-71511

Screen size:- 12"
Char. size:- —
Lines x Cols:- —
CA:- —
Colour:- Green
Sp. Char.:- —
No. of keys:- —
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- —
Baud rates:- —
Printer port:- —
Light pen:- —



Other fonts:- —
Price:- £645

Options:- RS423 interface, other character and graphics sets.

PENTLAND

PENTLAND Mk VIII
Manuf. CPU Computers,
St. Johns, Woking, Surrey.

Screen size:- 12"
Char. size:- —
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- Yes
No. of keys:- 90
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS232
Baud rates:- 50-9,600
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £465

Options:- 20 mA current loop, Auxiliary interface.
Notes:- Newly introduced low-cost terminal.

PERICOM DATA SYSTEMS

6801
Manuf. Pericom Data Terminals
1-3 Burners Lane, Kiln Farm,
Milton Keynes, Bucks MK11 3BA
0908-564747

Screen size:- 15"
Char. size:- 7 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- Optional
No. of keys:- 87
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 75-9600
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £985

Options:- Extra page of screen memory.
Notes:- Ergonomically designed simple editing terminal.

6802

Screen size:- 15"
Char. size:- 7 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- Optional
No. of keys:- 131
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 75-9600
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £1,085

Options:- Extra screen memory.
Notes:- Extended version of 6801 with 24 pre-defined function keys.

6803

Screen size:- 15"
Char. size:- 7 x 9
Lines x Cols:- 24 x 132
CA:- Yes
Colour:- Green
Sp. Char.:- Optional
No. of keys:- 87
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 75-9600
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £1,285

Options:- Extended keyboard as the 6802.
Notes:- Designed for use in the word processing market with the wide screen display which can be reset to 80 columns.

6807

Screen size:- 15"
Char. size:- 7 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- Optional
No. of keys:- 84
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 75-9600
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £1,350

Options:- Extended keyboard.
Notes:- Fully VT100 compatible terminal with four different character formats available.

PERKIN ELMER

BANTAM 550
Manuf. Perkin Elmer Data Systems
227 Bath Road, Slough,
Berks SL1 4AX
0753-34511

Screen size:- 12"
Char. size:- 5 x 9
Lines x Cols:- 24 x 80
CA:- —
Colour:- —
Sp. Char.:- —
No. of keys:- 66
Numeric pad:- Yes
Cursor keys:- No
Interface:- RS 232
Baud rates:- 110-9600
Printer port:- No
Light pen:- No
Other fonts:- Optional
Price:- £550

Options:- 20mA current loop interface, Printer port.
Notes:- Glass Teletype VDU.

SUPER OWL 1245/51

Screen size:- 12"
Char. size:- 7 x 11
Lines x Cols:- 24 x 80
CA:- —
Colour:- Optional Green
Sp. Char.:- Yes
No. of keys:- 82 or 98
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 110-9600
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £1,250

Options:- Two types of detached keyboard, Light pen.
Notes:- Block mode editing terminal with special business form character set and 25th status line.

SOROC

IQ 120
Dist. Strumech
Portland House, Coppice Side,
Brownhills, West Midlands
05433-4321

Screen size:- 12"
Char. size:- 5 x 7
Lines x Cols:- 12 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 74
Numeric pad:- —
Cursor keys:- —
Interface:- RS 232
Baud rates:- 75-19,200
Printer port:- —
Light pen:- —
Other fonts:- —
Price:- £ — unknown

Options:- Block mode, Printer port.
Notes:- Functional basic editing terminal..

SOUTHWEST TECHNICAL PRODUCTS

CT-82
Dist. Southwest Technical
38 Dover Street, London W1.
01-491 7507

Screen size:- 8"
Char. size:- 7 x 12
Lines x Cols:- 16 x 82
CA:- Yes
Colour:- Green
Sp. Char.:- Yes
No. of keys:- 68
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 50-38,400
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £700

Options:- Light pen option, Various screen formats.
Notes:- Full editing terminal for use with the SWTP micros or as a stand-alone device.

TANDBERG

TVD 2200
Dist. Farnell International
Sandbeck Way, Wetherby,
West Yorkshire LS22 4DH
0937-63541

Screen size:- 15"
Char. size:- 7 x 9
Lines x Cols:- 25 x 80
CA:- Yes
Colour:- Green
Sp. Char.:- Yes
No. of keys:- 122
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS422, V24
Baud rates:- 50-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- Yes
Price:- £1,200 approx.

Options:- 20 mA current loop.
Notes:- Ergonomically designed VDU with detached keyboard and programmable key functions.

TELERAY

MODEL 10
Dist. Teleprinter Equipment Ltd.,
Akeman Street, Tring, Herts HP23.6AJ
044282-4011

Screen size:- 12"
Char. size:- 7 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 98
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 50-9600
Printer port:- Yes
Light pen:- No
Other fonts:- Optional
Price:- £680

Options:- Emulators for VT52, Data General and Prism.
Notes:- In common with the rest of the range the VDU has a choice of four casing options including rack-mount.

MODEL 11

Screen size:- 12"
Char. size:- 7 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- APL set
No. of keys:- 98
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 50-9600
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £680

Notes:- The unit is supplied with the full APL character set including all the overstrike codes.

MODEL 12

Screen size:- 12"
Char. size:- 7 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 98
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 50-9600
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £870

Options:- 20mA current loop interface.
Notes:- De-luxe version of the "10" with extra programmable function space and a two page memory.

TELEVIDEO

TV1-912
Dist. No current main distributor. Various sources still carry stocks.

Screen size:- 12"
Char. size:- 7 x 10
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 84
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232, 20mA
Baud rates:- 75-19,200
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £585

Options:- 2 page memory, Printer port, VT52 emulation.
Notes:- Intelligent editor with standard features like Block mode and memory protect.

TV1-920

Screen size:- 12"
Char. size:- 7 x 10
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 105
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232, 20mA
Baud rates:- 75-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £685

Notes:- Full feature editing terminal with remote editing capability.

TEXAS INSTRUMENTS

OPTI 940
Manuf. Texas Instruments
Manton Lane, Bedford MK41 7PA
0234-67466

Screen size:- 12"
Char. size:- 7 x 9
Lines x Cols:- 24 x 80 or 12 x 132
CA:- —
Colour:- Normal
Sp. Char.:- —
No. of keys:- —
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS232
Baud rates:- 110-19,200
Printer port:- Yes
Light pen:- —
Other fonts:- Yes
Price:- £—

Options:- One or three extra pages, smooth scroll.
Notes:- Full function editing terminal.

VISUAL TECHNOLOGY

VISUAL 200
Dist. Wilkes Computing Ltd.,
Bush House, 72 Prince Street,
Bristol BS1 4HU
0272-25921

Screen size:- 12"
Char. size:- 7 x 9
Lines x Cols:- 24 x 80
CA:- Yes
Colour:- —
Sp. Char.:- —
No. of keys:- 93
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 110-19,200
Printer port:- Yes
Light pen:- No
Other fonts:- —
Price:- £795

Notes:- Full feature editing VDU which is programmable to emulate Hazeltine 1500, ADDS 520, ADM-3A or DEC VT52 machines.

ZENITH DATA SYSTEMS

ZENITH Z19
Manuf. Zenith Data Systems
Bristol Road, Gloucester GL2 6EE
0452-29451
London shop — 01-636 7349

Screen size:- 12"
Char. size:- 5 x 9
Lines x Cols:- 25 x 80
CA:- Yes
Colour:- —
Sp. Char.:- Yes
No. of keys:- 84
Numeric pad:- Yes
Cursor keys:- Yes
Interface:- RS 232
Baud rates:- 110-9600
Printer port:- No
Light pen:- No
Other fonts:- —
Price:- £851.25

Options:- 20mA current loop adaptor.
Notes:- Z80 based full editing terminal. The unit is also available as a 'Heathkit' to save money.

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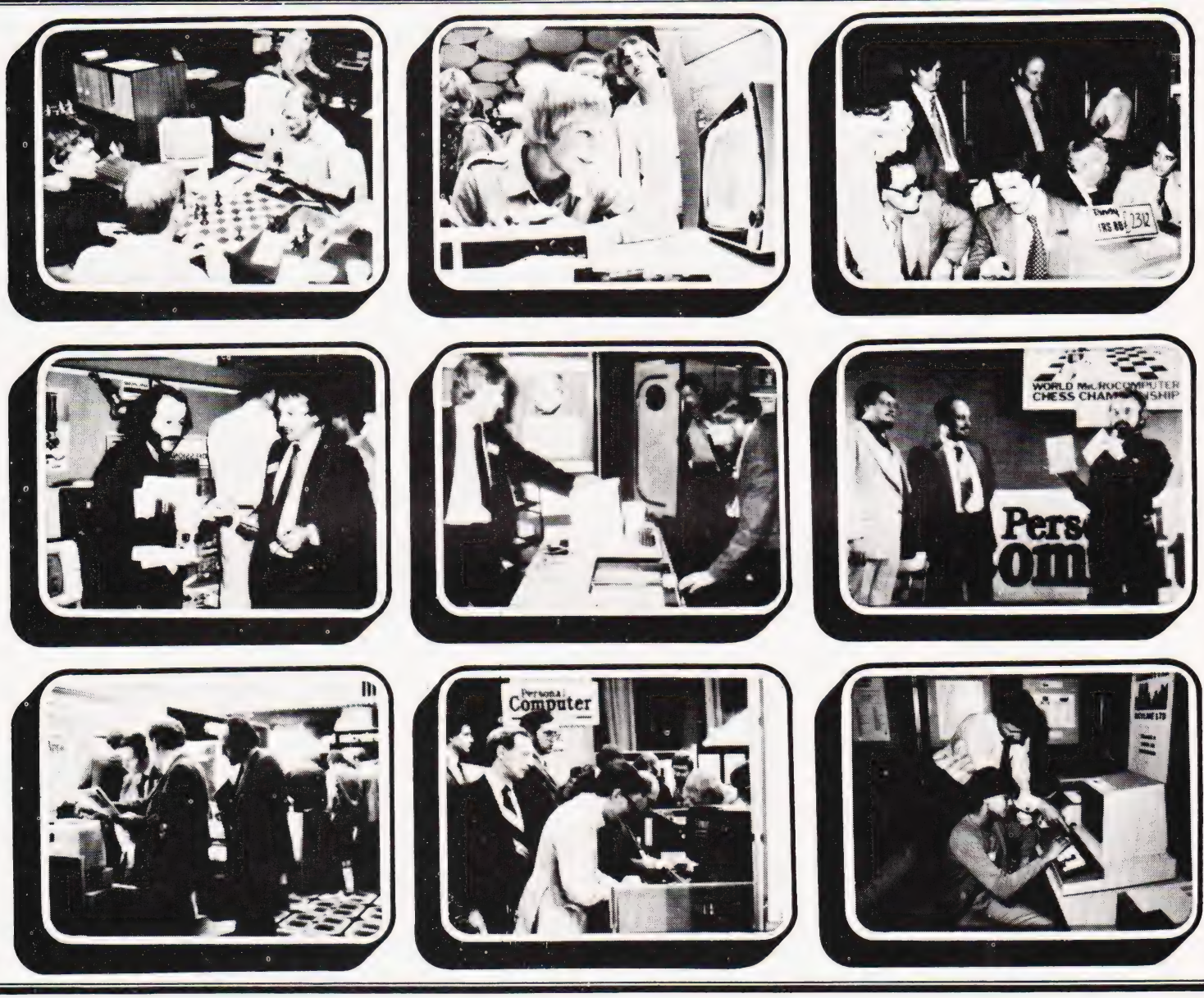

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September 1980
Pascal overview, PC 1211 reviewed, BASIC dialects, Othello and Ski Run programs.

March 1981
SuperPET review, 6502 programming course, Boolean algebra on micros, Golf simulation.

April 1981
Acorn ATOM review, S50 bus revival, Fantasy games surveyed, Softspot Special.

May 1981
Colour Video Genie review, Programming languages, ZX80 books surveyed, Everest game program, Multipurpose interface.

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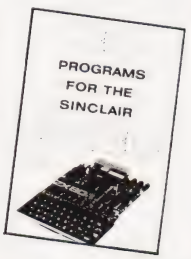

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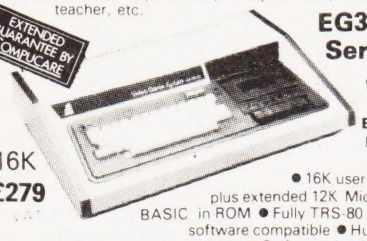

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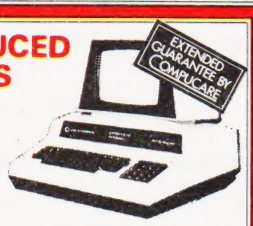

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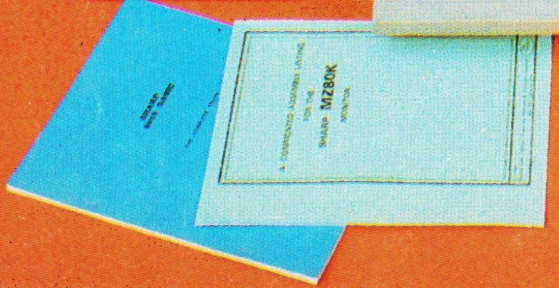

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